NATIONAL AIRCRAFT SHOW REPORT NUMBER

AVIATION

The Oldest American Aeronautical Magazine

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AVIATION

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EDWARD P. WARNER, *Editor*

LOUIS E. STOLL, *Publishing Director*

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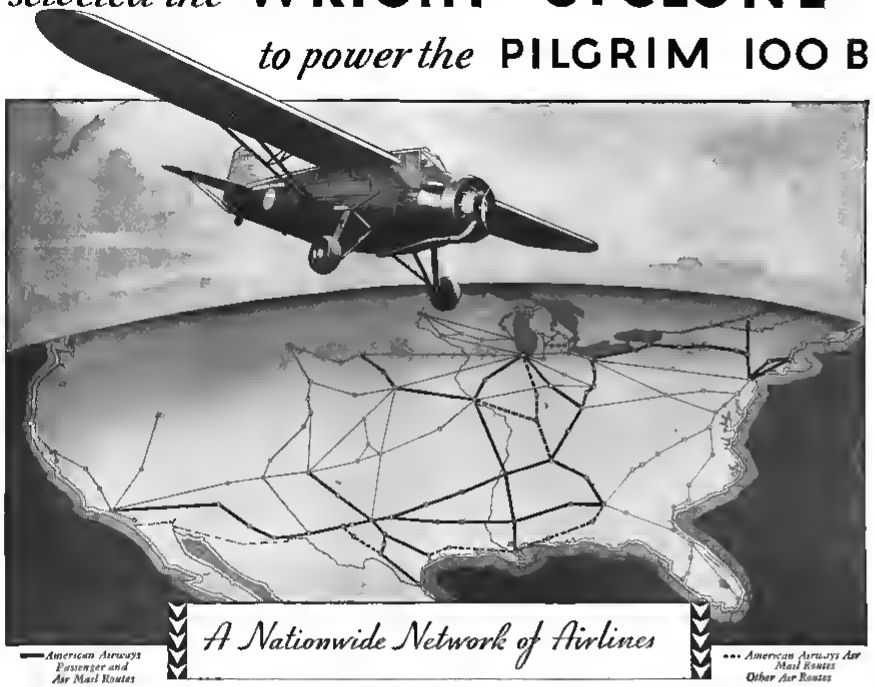

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AVIATION
FOR MAY, 1932

Economy and the air show

Efficiency rather than novelty is seen in the exhibits of the fifth annual Detroit exposition

ECONOMY, the daughter of depression, was the guiding spirit of the air show at Detroit. It was manifested in the exhibits and the personnel, the detailed designs of airplanes, engines and accessories, the demonstrations and flying activities on the airports, and even in the entertainment that plays such an important part in any exposition of this character It could be found in unexpected places, like the hangar restaurant where better food was offered for the same high prices, and in the choice of transportation where it prompted visitors to shun the taxicab and wait in wintry winds for trolley cars and buses And with all, the observing visitor could not leave the show without a definite impression that the aviation industry in all its ramifications is operating now on a far more efficient basis than it has ever known

A slight concession had been made to those exhibitors who requested an earlier show than usual in that the period was designated April 2-10 by the Detroit Board of Commerce and Aeronautical Chamber of Commerce, sponsors of the exhibition, but there was still dissatisfaction in some quarters because of the lateness of the opportunity to introduce spring models In most cases however, manufacturers involved had made formal announcement of their 1932 offerings long before the opening of the show

The combination of a relatively early opening and a late spring reacted unfavorably against the management for the first time in the five years of Detroit show history, and when the opening day arrived machines intended for exhibit were strewn across the country in intermediate fields from New York to Colorado The more fortunate participants who had managed to push through the low visibility conditions, and arrive a day before the opening worked feverishly through the night to prepare their offerings for the preview in the morning, but, as many of the invited guests had started for the show by air, the previewers were but a handful

Another feature of the opening day was the reception of the Collier trophy which had been presented to Alvin Macauley, president of the Packard Motor Company, by President Hoover in Washington two days before The trophy arrived from Cleveland on a Transamerican airline plane and was placed in the Packard booth where it was exhibited throughout the show. Other awards, such as the Thompson and Aerol trophies were exhibited

Fortunately for the late arrivals, there was comparatively little novelty in the exhibits Most of the offerings were clothed in last year's raiment, and many of these were thrice worn presentations This did not detract from the attractiveness of the individual exhibits, but rather indicated that the displays were designed originally for permanence and not to be discarded after the brief period of a single showing. Few if any of the spectators recalled last year's show in such intimate detail as to be aware that they were seeing some parts of it over again The decorations in the hangar failed in some degree to give the impression of a

sylvan bower, for which they were intended. Then, too, the airplane and the tree are natural enemies, and should not be too close together. The translucent airway markers, on the other hand, were a decided improvement, and served their purpose better than any previous device adopted as a guide to aid the visitors in solving the intricacies of the hangar. A showroom atmosphere was created through the use of painted floor space.

Exhibits as a whole were more highly colored and better lighted than in the past, and the use of decorative rudder posts and beacons contributed largely to the aeronautic atmosphere. Several of the accessory booths made excellent use of these devices and one noteworthy application was that made by the Bellanca Company.

A number of attractive fences were employed to circumscribe exhibits and perhaps the best examples were the welded steel tube design by Fairchild and the Pitcairn creation of rope and upright stanchions made of autogiro rotor blades, complete in detail even to the hinged mounting at the base. A fence of steel wing beams, presumably heat treated, surrounded the Metlab exhibit.

Not all of the exhibits, however, were inclosed behind permanent or semi-permanent fences. Several employed the conventional form of metal stanchions with colored cord, and these had the definite advantage of telescoping. In fact, this arrangement aided in the mysterious disappearance and re-appearance of airplanes from the floor during the progres sof the show.

To the initiated there was widespread disappointment because of the non-appearance of the new Ford transport, the testing of which could not be completed in time for the show. Interest in the Ford exhibit was heightened by the new eight-cylinder automobile engine, a much simpler and less expensive feature than the Plaster Grant of last year's exhibit but at least equally effective as an attraction.

Attention was also attracted by a two-ton truck suspended in a sling from two heat-treated steel wing beams. This was included in the offering of Metlab and action was provided in the exhibit of the Pennsylvania Aircraft Syndicate by a revolving rotor system of the Wilford Gyroplane.

Six military and naval planes were exhibited in various parts of the show. The exclusive Army exhibit was the first to be included in an aircraft show in three years.

Attendance

Automotive exhibits centering around the new Ford and Chevrolet machines joined forces with the weather against the general management on the opening day, and while thousands of persons viewed the new automobile, relatively few attended the air show. In line with the general trend toward efficiency, however, it is interesting to note that, although the attendance figure for the opening day was considerably lower than that of last year, the gate receipts were higher by some $650, because of the decrease in the number of gratuitous admissions. The total for the show period was 63,685. It fell considerably below the 90,000 of last year, but by no more than the normal percentage of drop which practically all current business indicators are showing in 1932.

In spite of the light attendance, presumed to be the result of financial conditions in Detroit, it is surprising to note that the International Model Airline was well patronized. This was well borne out by persons seeking gratuitous transportation subject to unsold seats in the Model Airline planes. The line carried 912 passengers. Aside from the Model Airline, the joy-hop business was good, and the records show that 2,338 persons went on sightseeing flights. Spectators outside the airport fence were estimated at approximately 375,000. More than 400 pilots registered at the airport and the most active day was Tuesday, when 82 signed the airport register. During the show 5,897 landings and take-offs were made and six minor mishaps occurred, of which five were inconsequential.

The problem of traffic regulation was not as difficult as it was last year, when a record was established for continued intensive use of an airport. Under certain weather conditions, the gas tank located almost in the center of the airport was a source of annoyance to visiting pilots, but the autogiro interests made spectacular use of the obstruction by hovering over it for long periods of time in a series of brilliant demonstrations. The orderly arrival and departure of transport planes and the efficient handling of these machines and their passengers and baggage was, as ever, a source of great interest to a large number of casual visitors who appeared to be unfamiliar with the high degree of development of American air transport systems. It will continue to be difficult, however, for the public to accept air transport as a serious business as long as the practice of high pressure joy-hop solicitation by unattractive men in dirty white overalls is permitted at air shows.

Sales managers devoted time formerly passed in padding sales reports for public release to contacting real prospects, arranging demonstrations and other details incidental to true sales. And not a single sale was formally announced at the press headquarters. The only release of this sort during the show was made by the company whose airplane was on the field and not officially in the show. A survey made on the closing day, however, indicated that sixteen planes, totaling in value more than $81,000 had been turned over. Sales by engine and accessory manufacturers brought the total to $100,000 according to an official release.

The economy motif was also present in the matter of literature and demonstration flights. In most cases, literature was carefully concealed beyond the reach of the hundreds of small boys who raced about collecting it. In one instance, that of the Stinson company, special literature was prepared for children and consisted of a large sheet bearing scale drawing of one of the company's airplanes and intended to assist the rising generation in the art of model-making. Demonstration flights were carefully controlled and limited through the use of passes carefully preserved by salesmen, and an unusual effort was made to differentiate between the prospects and the suspects.

A certain amount of confusion arose in the minds of some of the visitors as a result of the lack of uniformity in presenting prices. A standard form of abbreviation, such as f a f. (fly away field) and a specific statement of equipment included in prices, would be of material assistance to visitors.

Price stabilization apparently has not been reached, but the tendency to cut prices competitively, so noticeable last year, has ceased. Whether or not the turning-point actually has been reached is a question, but at least one manufacturer announced a price increase, when on April 6 Maj. Thomas G. Lamphier made a statement that the three-place, 100 hp. Kinner Bird would be sold for $3,495 instead of $2,995, the price at the opening of the show.

The necessity for installment selling has impressed itself upon those associated with the distribution of airplanes. As a result, there are as many finance plans in vogue as there are planes for sale on time and these involve charges ranging from insurance plus a five-dollar handling charge to 15 per cent or more of the cost of the airplane. It was reported that one new airplane, the new Kinner low-wing monoplane, which was not at the show is to be sold on the installment plan without insurance.

Aircraft

Nowhere was the spirit of economy more strongly emphasized than in the plane designs presented at the show. The principles of economics so frequently forgotten in the dominance of military design, have been revived and engineers are seeking ways and means of increasing performance without increasing power. The purity of science has been profaned by thoughts of dollars and even cents, and technical attention has been forced to a consideration of such factors as operating cost per mile. Two schools of thought in transport design are in the process of formation, one advocating speed before economy, the other, economy before speed. Of these the last-named group predominated. Economy in maintenance is being considered as it never has been before.

While this applies particularly to the transport group, the trend toward economy is just as noticeable among the airplanes offered for non-professional flying and for fixed base operation. Even the private owner is thinking now in terms of maintenance cost. Safety and comfort have not been overlooked.

The show was devoid of new and unusual types, with the possible exception of the Wilford Gyroplane rotor which was not shown on any airplane but alone in a set up to demonstrate its principles. There were no such presentations as the autogiro and the Stout Sky Car of 1931. The autogiro was present in force, but no longer as a novelty. Perhaps the most advanced design was found among the engines

Seen at the show hangar

OLD MAN KENDALL in a golden-anniversary suit of clothes, saluting Doc Kincade's and Herb Shearer's friends as they passed by . . . The total absence of low-wing monoplanes . . . The chrome-plated Curtiss Wright propeller display . . . The three-engined starter layout on the Heywood stand, connected up to crank over fake propellers mounted against the backdrop . . . The gorgeous collection of glittering diesel parts in the Packard display . . . The black-and-white marbled side walls on the Goodrich tires on the Wacos . . . The fire-engine red Bellanca Airbus, and its highly-polished surfaces . . . The highly decorative golden bronze finish on the Club Ford. . . . The minature insignia,—lightning flashes, and the like,—used to touch up conspicuous spots on the Stinsons . . . The sales managers for an airplane and an autogiro, once employed by the same company, trying to sell each other ships. . . .

THE highly professional manner of the small boys who climbed into the cabin Fairchild and tried the controls . . . The United compass-swinging platform . . . Ray Cooper, in a hurry. . . . Jack Nevil, ditto . . . Cliff Henderson, taking things easy at a show that somebody else had to run. . . . The gathering of aircraft-industry alumni, now pursuing other paths . . . The earnest efforts of mechanically-minded spectators to stick their heads far enough inside the N.A.C.A. cowling on the Vought Corsair so that they could see how the Pratt & Whitney double-row radial was put together . . . The Stout Sky Car, stuck in the mud,—but its owner had not been piloting it . . . The pilot who looked at the Upson Air-izon and said: "It can't be any good, it isn't complicated enough." . . . The young ladies who expounded the virtues of the Brazil and Taylor light planes . . . The super modernistic furniture presented on the Engineering Research Company's stand as a product of their machine . . . The visitors who were more interested in the furniture than in the machine, and wanted to buy it on the spot . . . The sales managers for accessory companies who lay in wait, hidden behind palm-trees or hat-trees on their stands, to spring out eagerly whenever an airplane builder went by. . . . The envious eyes that youthful visitors cast on the Berryloid models . . . The Pitcairn triumphal arch, made of rotor blades . . . Waco's large collection of bas-reliefs illustrating alternative color schemes . . . The pendulum auto-stabilizer on the Brazil plane. . . . The Alexander Fly-About for two people and a puppy . . . The ollless exhibit of the Stanavo Specifications Board . . .

MISS JOYCE HARTUNG, age nineteen months, completely attired in flying clothes but not quite large enough to reach the top of a good sized airplane tire. . . . The youthful collectors of aviation literature. . . . The curious shapes of tubing turned out by the Parker Tube Bender . . . The mysterious disappearance of several airplanes from the show floor.

in the Pratt & Whitney fourteen-cylinder, double-row, radial Wasp Junior, which is discussed in detail on page 241 of this issue.

Design trends

Definite reversals of several important design trends are indicated by statistical study of the 1932 airplanes as compared with the groups of three preceding Detroit expositions (see page 210). The numerical supremacy of the biplane, for instance, reached its peak in 1931, and has since receded by 7 per cent. Not a single low-wing or center-wing monoplane was on the exhibition floor, but a highly interesting representative of the type, a custom-built Kinner plane, made several appearances on the monoplane type at the field. The disappearance of the low wing show, however, is not a true picture of the situation in the industry. Several important machines embodying this practice are in the process of design.

Above: A patriotic, anti-depression spring coat was provided for the Nicholas-Beazley NB-8, the diagonal stripes were done in red, white, and blue. Left: The Deluxe Model Great Lakes Trainer. The power plant is a 85 hp American Cirrus engine. Below: Inclosures were provided even for autogiros,—the Kinner-powered Kellett K-3 was exhibited with its cabriolet cockpit. The inclosure is removable.

Flying boats and seaplanes, which had been on the increase since 1929, completely disappeared, and there was only one amphibion against the six of 1931. The two folding-wing machines of the Nicholas-Beazley Company increased the percentage of this type from 1 to 5. At the 1929 show there were seven machines with folding wings, but in the ensuing two years the proportion of such machines to the total was very small.

The three-place type of airplane is once more on the upgrade, following a continuous decrease since 1929. Two-place machines continue to increase at an even higher rate since 1931.

The study also indicates a definite reversal of the decrease in proportion of radial-engined planes. They show a gain, obviously at the expense of the vertical and inverted-in-line types.

A most important trend that has not been reversed is that toward the closed type of plane, supported by the several manufacturers of open planes who have provided enclosures to protect occupants from weather. The practice has extended even to the autogiro field as exemplified by the Kellett K-3. The proportion of single-engined planes has remained constant since the show of 1931.

The relatively small representation of transport machines detracts somewhat from the value of our study of single versus multi-engined types. Each of these classes was represented by a new design, the Pilgrim in the single-engined group, and the Stinson in the multi-engined class. It is quite generally known that there are a number of single-engined designs on drafting boards at present, although there was no other evidence of them at the show. The twin-engine machine as a type suffered severely through the absence of amphibions in the show.

Expected losses in the ranks of single-seaters were balanced out to a degree by the presence of several special designs, but they were not to be confused with the single-seaters of last year's show, most of which were contributors to the light plane boom of 1931. The new examples are relatively higher performance sport or mail ships, which might readily be converted to carry two or more passenges without major modifications. The single-seat light plane has virtually disappeared, and now even the very light types have passenger provision for two persons, in spite of the fact that such accommodations, particularly in side-by-side seating arrangement, are in some cases rather cramped.

Only one true single-seater light plane was observed, and this one was presented in parts for home assembly. This machine, the Heath, is the first to receive the Department of Commerce approval for amateur construction.

Opposed engine installations are holding their own, and a diesel-powered machine appeared. Disappearance of the OX-5 engine has been quite complete, two years having passed without a single one having been exhibited. The non-appearance of the new Ford transport left the liquid-cooled engine installation without representation.

Weight classification

Interesting trends are shown by breakdowns by weight. Where ten planes fell below 1,000 lb. last year, this year there were only six—the two Aeroncas, the new Alexander Fly-About the Brazil Lion, Rearwin Junior, and the Taylor Cub.

Again the 1,001 to 2,000-lb group was the largest with thirteen planes—two of the new Curtiss-Wrights, the Fairchild 22 and 24, the Great Lakes Trainers, all four Monocoupes, two NB-8s, and the Laird Solution.

Second in numbers were the planes of 2,001 to 3,000 lb., and nine were present — three Birds, two Curtiss-Wright machines, including the new Akron Fighter, and all four Wacos.

Only four planes in the 3,001 to 4,000-lb class were represented — the two smaller Stinsons and the Sikorsky S-39. Two Bellancas, the Skyrocket and Pacemaker, and the Vought Corsair accounted for the 4,001 to 5,000-lb class. There followed a long gap. American Airplane's Pilgrim 100-A alone constituted the representation of 5,001 to 9,000-lb machines.

Two each were found in the group of 9,001 to 10,000, and above 10,000 lb. The Stinson Transport and the Bellanca Air Bus were the first of these, the two Fords the last.

Landing gears

Probably the most important campaign in the struggle for efficiency is that directed against the drag of landing grars. A determined effort to clean up undercarriages was observed, but none of the airplanes exhibited had retractable gears. A close approach was seen however in the uncovered structure of the Stinson Model S in which the wing stub provided enough space for a well in which to retract the wheels. The Stinson and Bellanca Pacemaker are examples of a highly refined landing-gear design, and the undercarriage of the Pitcairn autogiro has been simplified to some degree. A particularly clean single-strut type of landing gear was that of the Curtiss F9C2, designed for military operation from the U.S.S. Akron. In this case the shock absorber is mounted at the lower end of the strut and completely covered by the fairing.

In spite of efforts made by some designers to reduce landing gear drag, there seems to be a decided opposite tendency in some cases, notably those concerned with airplanes of the fighter type. Simplified to the limit in general structure, the landing gears of some of these machines were exhibited without benefit of even the most rudimentary form of fairing.

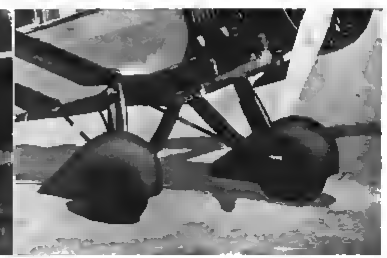
The rubber type of shock absorber is rapidly disappearing, and only two machines had such equipment. Oleo devices of various sorts have been incorporated in virtually all of the landing gears, but one of the airplanes had a steel-spring shock-absorber. Thirty-nine per cent of the machines had air-wheels, and 28 had wheels of the semi-balloon type. Eighty-five per cent of the airplanes had brakes, an increase of 17 per cent over last year's record. The number of machines equipped with wheel "pants" was quite misleading, an actual count showed that only 31 per ceot were so equipped. They can be obtained, however, for almost any standard plane.

Cowling

Another opportunity to increase efficiency is found in cowling design, particularly as applied to radial engines. The ring type continues to gain over the N.A.C.A. type. Though 63 per cent of the cowled machines last year had ring cowling, 84 per cent were so equipped in 1932. The determining factor in cowling selection between these two types continues to be the relationship of engine diameter to fuselage diameter.

An interesting cowl was found in the Waco exhibit, its principles applied particularly to the Kinner engine. The Waco cowling fits close to the cylinder heads and provides streamlined bulges to accommodate the rocker boxes. Such an arrangement is not undesirable from a resistance standpoint for an engine having as few as five cylinders.

The tendency toward tighter cowling is also noted in the Curtiss F9C-2, the installation of which was so compact as to render difficult the shielding problem, and in the fourteen-cylinder Wasp Junior installation of the Vought machine. In the latter case, an ingenious inner cowling was introduced to provide proper cooling for the cylinders of the second row.



Above: An extreme case of clean landing gear design—the Curtiss F9C2 Akron Fighter. Left: Streamlined fairing was eliminated on the Aeronca oleo landing gear. Lower left: The complex landing gear construction of the Pitcairn autogiro has been simplified by the elimination of one of the struts. Lower right: Increased performance has been gained through the use of low drag landing gear on the Bellanca Pacemaker.

Propellers

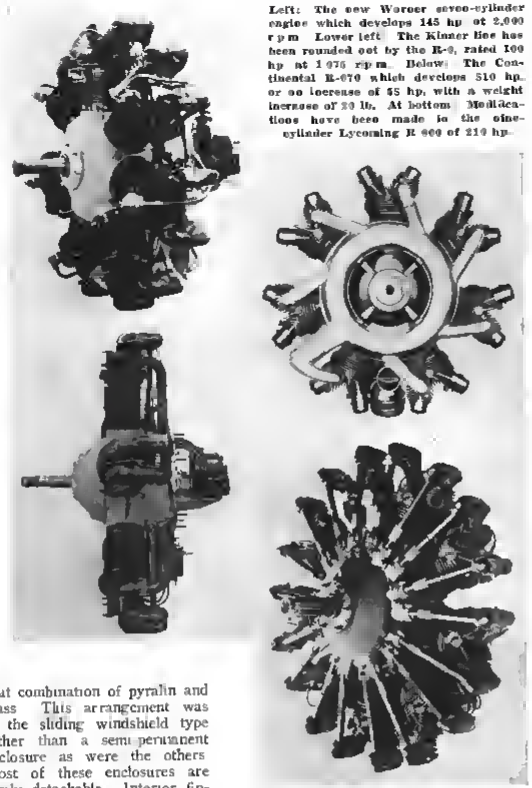
Sixty-four per cent of the machines or a slightly larger proportion than in last year's group, were fitted with metal propellers. Wooden propeller equipment was confined to airplanes of gross weight up to approximately 3,000 lb. Variable pitch propellers were employed on several of the airplanes, and an in-

teresting collection of them was available for study in the accessory exhibit. In addition to the two devices of this type introduced at last year's show, two new ones were presented at the more recent exposition. One of them, the Bendix automatic type, developed at the plant of the Eclipse Aviation Corporation, is completely automatic, with the operation controlled by thrust on the blade acting against a spring arrangement. Its weight, with standard blades, is 147 lb.

The second device is of the controllable pitch type, developed by the Smith Engineering Company of Cleveland, and constructed with hollow blades and hub fabricated from chrome vanadium steel, properly heat-treated. The device embodies a system of gearing which provides a gear ratio of 4760:1 and provides a possible pitch change of 2½ deg. per sec. This ratio can be changed by the pilot in flight to any slower rate of change desired. The 9-ft. two-blade model complete with cockpit control weighs about 120 lb.

The welded hollow steel propeller of the Pittsburgh Screw & Bolt Corporation has undergone further development, and a magnesium alloy propeller was shown by the Dow Chemical Company.

Seventy-one per cent of the machines at the show were equipped with stick control, and dual control was available on practically all except the single-place models. Rudder pedals are almost universal. A particularly interesting combination brake and throttle control is employed on the Waco. This device is virtually an enlarged throttle lever in which fore and aft motion controls the engine and lateral motion the brakes. An automatic lateral stabilizer operating on the pendulum principle was one of the features of the Brazil Lion.



Left: The new Wurcer servo-cylinder engine which develops 145 hp at 2,000 r.p.m. Lower left: The Kinner line has been rounded out by the R-9, rated 100 hp at 1,975 r.p.m. Below: The Continental R-670 which develops 210 hp., or 20 increase of 55 hp. with a weight increase of 20 lb. At bottom: Modifications have been made in the nine-cylinder Lycoming R-680 of 210 hp.

Seating and interiors

An unprecedented proportion of airplanes with side-by-side seating arrangement were in evidence at the show. Of the entire number of two-place machines 68 per cent were arranged for side-by-side seating arrangement. In the open-cockpit types a slight widening of the fuselage provides excellent accommodation for two persons, and the space gained through the elimination of the second cockpit is frequently used for baggage.

Attention is being given to the necessity of providing adequate baggage space for private owner airplanes, and again the Waco through its rearrangement of fuselage, furnished a good example.

Private-owner interest and demand is also being fostered through the introduction of removable enclosures, such as those seen on the Travel-Air Sportster, Waco Model A, Aeronca and Nicholas-Beazley, as well as the Kellett autogiro. While most of them were constructed entirely of pyralin with light structural material, the Curtiss-Wright provided a neat combination of pyralin and glass. This arrangement was of the sliding windshield type rather than a semi-permanent enclosure as were the others. Most of these enclosures are easily detachable. Interior finishes and fittings continue to follow automotive practices, and as a whole, the color schemes were for the most part simple and harmonious and exterior finishes were probably the best that have ever been seen at any aircraft show. The golden bronze and cream-colored exteriors of the two Fords were particularly noteworthy.

Attempts to reduce blind areas were noted in several cases and the overhead windows of the Fairchild and Taylor machines ware particularly good examples. The new Waco cabin biplane has not only an overhead window but also window panels in the rear of the cabin.

No new metal airplanes were included in the exposition, and no fundamental changes have been made in the materials used in airplane structures. While metal framework is employed in many cases for both wings and fuselage, fabric covering was almost universal, excepting such machines as the Ford transport, and certain military models. Metal covered ailerons, however, were used increasingly with fabric covered wings as in the new Fairchild plane.

The gull wing type of construction has penetrated the field of commercial design, and its advantages from a visibility standpoint and external bracing has been simplified. Advantages in the use of wings as baggage containers in transport planes have been recognized, and luggage wells were shown in the Ford, Stinson, and Bellanca Airbus.

Among the autogiros, the Kinner-160 Pitcairn with two struts, wire-braced rotor pylons, enlarged rotor area, separate rotor blade brake and clutch control, and tail wheel, was extremely attractive in its black and white finish.

The Kellett K-3 with a series of refinements, the most noticeable of which was the removable cabin enclosure, also attracted a great deal of attention. More power and a change in the setting of the fixed wings were reported to have increased the maximum speed over 15 m.p.h. Both of these machines are scheduled for detailed description in an early issue of AVIATION. The rotating wing system developed by E. Burke Wilford from the Rieseler-Kreiser patents and embodying a feathering rather than articulated blade attachment was demonstrated.

Although not actually on the exhibit floor, the Privateer was available on the field for demonstration and a space on the show floor was provided by its manufacturer, Amphibions, Inc. The Privateer was described in some detail in AVIATION for March, page 148. Among the other interesting machines that were to be seen only on the field was the low-wing cabin plane built to the personal requirements of Robert Porter, president of the Kinner company.

Engines

The major trend observed in engine design was also closely related to economy and efficiency. More important than the increases in power output observed were the decreases in specific weight. Attainment of a figure of 1.33 lb. per hp. in the Pratt & Whitney double-row Wasp Junior is an outstanding accomplishment.

In addition to the decreases in specific weights that were found in most of the new models of engines exhibited this figure being approximately 2 lb. per hp. in the medium weight range progress has been made toward simplification of design for maintenance purposes, and in improving the mechanical aspects to provide longer periods between overhaul in actual service. Practically all of this development has been accomplished with strict adherence to conventional design principles, with the possible exception of the new Pratt & Whitney double-row radial.

Of twelve manufacturers of engines, ten showed radial types, two of which were Diesels. The remaining two were manufacturers of in-line engines exclusively. The Continental Aircraft Engine Company was the sole champion of the opposed cylinder design.

The offerings of the American Airplane & Engine Company and American Cirrus engine have been seen before, but not in such a highly improved form. And the Aeromarine and Jacobs exhibits were essentially the same as those of previous shows, except for detailed refinements. Fundamental changes in internal dimensions have been made by Lycoming and Continental, and new models following their predecessors closely, but intended to round out the range of available power plants, were presented by Kinner and Warner. Increased supercharging and compression ratios are the main factors in the development of the new series of Pratt & Whitney and Wright engines. Since last year's show, a series of detailed developments have been made in the unique design of the Guiberson diesel (see AVIATION for April for description). It is now ready for Department of Commerce tests. The Packard diesel was essentially the same as last year's model.

Other exhibits

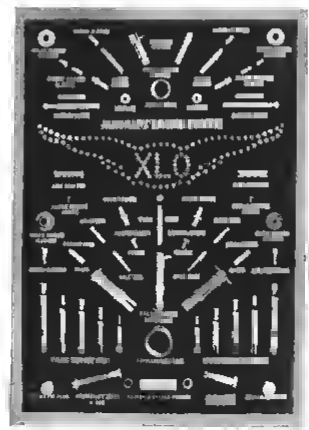
The efficiency theme was also predominant in the accessory group, and one of the major contributions was made by the variable pitch propellers previously described. Economy in maintenance was reflected in the accessory group through improvement in parts and instruments requiring servicing attention and simplification of devices associated with airplane operation. It is significant that an oil reclaiming device was exhibited, for the first time at any aircraft show by Skinner Motors, Inc. The new magneto synchronizer developed by Breeze Corporations, Inc., is an interesting maintenance time saver.

Several new production machines made their appearance at the show. While these machines are all ingenious and attracted much attention, they were subject to some criticism on the ground that their capacity in general is too large to satisfy the present needs of the aircraft industry. In any case their versatility compensates their high capacity to some degree. One of the most ingenious of these machines was the sheet-metal former offered by the Engineering and Research Corporation, of which Henry A. Berliner is president. The metal is screwed or clamped to a form and is then fed by hand past an oscillating member, which bends the metal against the form.

The Metlab Universal Speed Saw is designed to cut tube, sheet, or bar stock at all angles and to make notches, mortises, slots, and multiple cuts with a high degree of accuracy. The tube bender demonstrated by the Parker Appliance Company is very useful where short radius bends are to be made in copper tubing. Photos of an electric spot welder and of production equipment in the Dicks propeller factory were displayed by the Aluminum Company of America and Pittsburgh Screw and Bolt Corporation respectively.

Considering the accessory manufacturers as a group, the companies whose activities are confined to the production of finished and raw materials for aircraft construction were the most numerous. A newcomer in the accessory field is the International Engineering and Manufacturing Company, of Detroit, and the feature of this exhibit was a patented pulley having a universal ball-bearing mounting to insure perfect alignment of the yoke.

The manufacturers of flight accessories proper were second in numbers, and have had no new additions to their ranks since last year's show. In this group particular attention was attracted in the Bendix display to the contribution of the Eclipse division, which included, in addition to the automatic



Right: The strength of heat treated wing beams was graphically portrayed by Metlab. Above: A highly attractive presentation for the precision parts produced by the Eo-Cell-O Aircraft & Tool Corporation.

variable pitch propeller hub, constant pressure fuel pump, an automatic regulator for supercharger output, and a fuel flow meter. The Bendix supercharger, which was awaited with interest, did not appear. The new magnetos offered by the Scintilla Company furnished a particularly good example of the attention given to maintenance in the design of accessories. The exhibits of the parachute manufacturers were also a source of interest and a great deal of attention was attracted by the transport type Irvin air chute and the device employed to demonstrate its usefulness. The Switlik Company displayed a combination of cabin chair and parachute, in sundry colors and upholstery fabrics. Sky Specialties Company had a glittering array of spinning propellers to depict the action of the Heywood injection starter.

A motor-driven fuel pump giving a suction lift of 12½ lb. was shown by the Evens Appliance Company.

Instruments

There were several interesting new devices among the exhibits of aircraft instruments. One of the most noteworthy was the Air-1-Zon, a simplified type of artificial horizon and angle-of-attack indicator developed by Ralph Upson.

The individual efficiency of airplane pilots has been considered in the new rotatable instrument designs displayed by Pioneer. An altimeter and air speed indicator, both of which it is possible to rotate so that the pointer will lie in a horizontal position for any desired normal reading, were features of the exhibit. A sensitive altimeter providing a complete rotation of the pointer for every 1,000 ft., and the new Gyrovisor, a variety of pitch and yaw indicator, were also included. A complete array of the electrically operated remote-indicating instruments constituted the General Electric exhibit, one of the features of which was the new motor-driven magneto-compass. Then supercharger impellers for as many types of engines were included in the exhibit. The most recent developments of Elgin watches and instruments were shown.

The airport group was represented by Pyle-National, Sperry, Westinghouse, and General Electric. The Westinghouse exhibit included airport lamps of from 10 to 10,000 watts, and the Sperry display featured the artificial horizon and directional gyro in actual operation on an especially constructed device.

To shield or not to shield was the question in the spark plug exhibit represented by B G., Bosch, Champion, Walter Kidde, and Hurley-Townsend. A new dirt-proof, water-proof, and oil-proof shielded spark plug was introduced by B G, while a new plug devoid of all shielding constituted the contribution of Walter Kidde. The trend, however, appears to be in the direction of better and more compact shielding. A very efficient spark-plug installation is found on the new Lycoming engine.

Products of a number of specialty and finished materials manufacturers were included in the exhibits of supply houses such as Curtiss-Wright, Nicholas-Beazley, and Air Associates. Among these was the flexible gas and oil line material manufactured by the Tite-Flex Metal Hose Company.

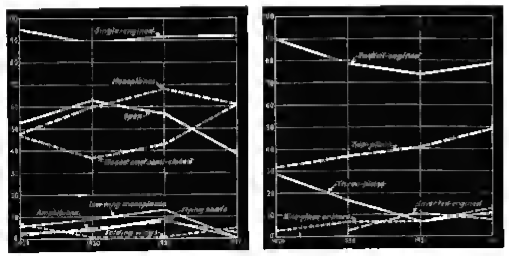
Various types of landing wheels mounted on roller bearings, and engines with rocker arms mounted on these bearings, were featured in the booth of the Timken Roller Bearing Company. Several moving devices were provided to lend attractiveness to the exhibit. Advanced types of ball bearings for aeronautical purposes were featured by Norma-Hoffman and Fafnir.

In addition to the light weight transport chairs displayed in the booths of the Aluminum Company of America and Dow Chemical Company, a new chrome-molybdenum steel tube chair was introduced by Metlab.

A great deal of attention was attracted by the air transport exhibits and the presence of uniformed attendants.

Comparative statistics of the Detroit shows

	1929		1930		1931		1932	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Total planes entered	109		75		75		39	
Monoplanes	48	46	45	60	51	68	24	61
Biplanes	47	47	29	39	23	31	15	39
Convertibles	1	1	0	0	0	0	0	0
Sesquiplanes	4	4	1	1	1	1	1	3
Low wing	6	6	7	9	10	13	0	0
Center-wing	3	3	0	0	4	5	0	0
Folding wing	7	7	1	1	2	1	2	5
High-wing	39	39	38	51	28	36	17	44
Parasol					29	12	6	16
Tractor	—	—	—	—	71	95	39	100
Pusher	—	—	—	—	4	5	0	0
Open planes	53	53	47	63	43	57	13	39
Closed planes	47	47	28	37	32	43	24	61
Land planes	95	93	68	91	62	83	38	97
Seaplanes flying boats	3	3	3	4	7	9	0	0
Amphibions	2	2	4	5	6	8	1	3
Single-engined	95	95	67	89	69	92	36	92
Twin-engined	1	1	2	3	3	4	0	0
Three-engined	4	4	5	7	3	4	3	8
Four-engined	0	0	1	1	0	0	0	0
One-place	4	4	2	3	13	17	4	11
Two-place	32	32	28	37	31	41	19	49
Three-place	29	29	13	17	5	7	4	11
Four-place	11	11	12	16	8	11	4	11
Five-place	5	5	0	0	1	1	0	0
Six-place	9	9	9	12	3	4	3	8
Seven and eight-place	7	7	6	8	9	12	0	0
Nine-place or more	3	3	5	7	3	7	5	13
Radial-engined planes	90	90	39	79	56	74	31	79
Vertical in-line air-cooled	10	10	5	7	5	7	1	3
Inverted in line-cooled			2	3	8	11	3	8
Opposed			1	1	5	7	3	8
Diesel			6	8	0	0	1	3
OX 5	9	9	2	3	0	0	0	0
Other water cooled			0	0	1	1	0	0
0-50 hp	3	3	2	3	12	16	6	16
51-150 hp	50	50	28	35	28	37	12	31
151-200 hp	14	14	4	5	5	7	3	8
201-300 hp	11	11	15	20	4	5	8	21
More than 300 hp	27	27	26	32	26	33	10	26



Percentages of various airplane classifications and types, based on the study of four Detroit shows

David L. Behncke, first president of the Air Line Pilots' Association organized in 1931. The Association is affiliated with the American Federation of Labor. The first pilots' organization in any country to take a place frankly among labor unions.

Carl F. Egge, formerly superintendent of the air mail service when operated by the Post Office Department, was business manager and executive of the National Air Pilots' Association from 1927 until its dissolution last month. The N A P A had no union affiliations, and had opposed them.

Airlines and pilots

The pilot's status, and his wage

THE dispute between Century Air Lines and its former pilots over proposed reduction in salaries projected into the foreground the broad problem of proper rate and basis of compensation for the transport pilot's services. It is a problem which will never be finally settled. There will be occasional flare-ups in the future, as in the past, and each of them will call up for consideration the allied problem of the fundamental position of the pilot, and of the division of responsibilities between pilots and ground executives.

Pilots as a group, like every other professional group in the world, will always wish that they could have larger incomes. Airline stockholders, like investors in any other enterprise having a large bill for specialized personnel services, will always wish that the figure of pilot compensation could be made to cut a smaller figure in the income statement. But conflicting economic interests can be adjusted and compromised if there can first be a general agreement on what kind of a man is needed as a pilot, on what qualities and training he must have, and on what opportunities exist for such a man elsewhere. In the long run the owners and operators of airlines, in their own selfish interests, are anxious to pay enough to attract personnel of the proper caliber and to prevent other industries from so outbidding them as to make an aeronautical career unattractive to youth. To attempt to do anything else in the short run, or deliberately to take advantage of the economic necessities of a group of men who have been trained as pilots and who cannot, on the spur of the moment, turn to any other well-paid employment would be an extraordinarily short-sighted policy.

Besides being the springboard from which the salary question has vaulted into the limelight, the Century affair had special significance as the first test of the collective bargaining power of a pilot group organized as a union with affiliations with a national labor organization, as an important phase of the struggle to maintain operations without mail contracts by cutting every possible item of cost to the limit; and as a showdown after a long period of apprehension on the part of many pilots lest a general drastic down-trend in salaries was about to set in.

Four previous disputes

There have been at least four previous disputes of a major order, three of which have reached the point of an actual refusal to fly by substantial groups of pilots. There have been wage strikes before this one, but most of the actual or threatened walk-outs have been only incidentally connected with compensation. They have resulted from conflicts over the more fundamental issue, already mentioned, of pilot responsibility and authority.

Thus, the first recorded pilot strike was called on the government-operated air mail routes in 1919 over the question of the pilot's competence to decide on safe flying conditions. The Post-Office Department had adopted the slogan: "The mail must fly." Some of the Department's officials proposed that the strict fulfillment of the slogan should never be relaxed except with the approval of headquarters. Pilots, most of them lately demobilized from the Army Air Service and filled with a characteristic disdain for "keewees," were unable to see how the flyability of the weather at Bellefonte could be decided from Washington, or even by a non-flying official on the spot. They declined to fly against their own judgment, and the "strike," of very brief duration, resulted.

That settled one issue, to stay settled for at least a dozen years. Since 1919 the universal rule in America and in Europe, has been that the pilot is the final judge of his own fitness and of the suitability of flying conditions. Incidentally, the same rule prevails in most of the air forces of the world in time of peace, although where squadron operations are concerned the squadron commander does the deciding for the group as a whole.

The question of pilot authority remained comparatively quiescent from 1919 to 1930, except for very minor excitements. The pilots on one important European airline objected so vehemently to the personality of an operations manager that they forced his transfer to other duties, and the pilots on National Air Transport, with the tacit approval of the management made strenuous com-

plaint against premature shift of the New York air mail base from Hadley Field to Newark. On the whole, pilots gained prestige steadily, except in one respect.

They lost their control over flying equipment. In the early days of the government-operated mail there were some injudicious purchases of airplanes that proved notably dangerous, or otherwise unsuited for the work. After that unhappy experience, the pilot was king. Not only was the selection of new equipment for three or four years very largely controlled by the views of a few of the line pilots, since most of the division operating superintendents were non-fliers and in no position to debate anything that the pilot said, but each pilot had his own plane and fixed it up to suit himself. The number, type, and placing of instruments, the location of engine controls, the arrangement of windshields and cockpit heaters, the decorative scheme and the application of special insignia on rudder or fuselage, and a variety of other details were determined by individual preferences. In due course, practically all of the lines acquired managers of operations who were ex-pilots, able to speak from their own experience and to insist on their own judgment in adopting standardized instrumental equipment and miscellaneous practises, and economic pressure forced the abandonment of the personal-airplane system, which had been requiring abnormally large reserves of equipment.

Quite recently, within the last three years and especially about 1930, a new problem has developed. The pilot's position has again been threatened. The introduction of instrument flying, the creation of new schools instructing by new methods, and the increased dependence placed on radio have threatened to leave some of the old-timers out on a limb. It was no mere accident that there was a perfect epidemic of personnel trouble on airlines in 1930. Trouble existed in many quarters, but in most of them it took itself out in grumbling or reached a quiet settlement by private discussions. On two lines, the German Lufthansa and the Dutch K.L.M., it became critical. In Germany it boiled over in public charges that the management was trying to force the pilots to fly in dangerous conditions, and using comparatively inexperienced men who knew no better as pacemakers to try and shame the veterans into going out in defiance of their own better judgment.

Most of the veterans, both in Germany and in America got their training during the war. They acquired their traditions when "instrument flier" was a term of reproach. The ideal of 1918 was the "natural pilot," who scorned any dials except a tachometer, oil pressure gauge, and possibly a compass. It hasn't been easy to shake off a set of ideas by which pilots had been living for a decade. Some of the old-timers in all countries kept strictly abreast of progress, and in fact were responsible for making the progress. Others clung tenaciously, at least until very recently, to the conviction that the pilot must always depend on his own instincts and acquired skill, that blind flying was madness, and that one must always stay below the cloud ceiling, however low it might be.

So it has happened that some of the veterans, and some of the pilots trained in the last few years since flight instruments and radio have begun to play a large part, have made it a matter of daily routine to do things that would have been suicidal folly during the war. And many of the war-trained pilots, on Lufthansa and on American lines as well, needed to acclimate themselves to the fact that times have changed.

Reconciliation to new ideas and new equipment has been a problem for the individual pilot. The definition of pilot responsibility, on the other hand, is a problem for the management of the line, and upon that score the introduction of radio and new flight instruments has threatened very serious changes.

Two years ago, following immediately on two bad airline accidents, talk suddenly turned to the need for a block signal system for airlines. The theory was propounded that the pilot no longer required anything more than manual proficiency, and that all decisions could be made on the ground and the pilot advised of the result by radio. AVIATION attacked that doctrine editorially as a totally unworkable one. No one has ever found means of depriving the captain of a ship of his discretion without inviting disaster, and discretion is even more essential to an aircraft pilot. The idea that he could become an automaton attached to a headphone, receiving his running orders and responding to signals like a locomotive engineer, had a comparatively brief life and has now disappeared.

The pilot's status

A new trade or profession is usually rated by analogy with some occupation that has already existed. Airplane piloting is no exception. The pilot has been variously compared with the captain of a liner, with a bus driver, and with a locomotive engineer. If any one of the comparisons is to stand it will make a deal of difference to the pilot, not only in his salary but in his general position in the community, which one it is to be.

Some of the simpler features of the four trades can be arranged in a table. All are alike in having an expensive piece of property, and a number of lives, in their care. In the degree of independent responsibility, however, there are wide differences among them. The engineer stands at the foot of the list, with running orders covering the speed to be maintained throughout the run, with a fireman in the cab to check his reading of the signals, and with automatic train-stops coming into use to insure safety even if the entire train crew should fall asleep. Very rarely indeed does anything unforeseen, requiring that a course of action be decided on the spot, happen on a railway line.

Next up the line is the bus driver, with more sudden emergencies to meet but with the possibility of guarding against most of them by reducing speed when conditions are bad. And finally there are the liner captain and the transport pilot. Both have to meet problems so varied, and so rapidly changing, that they cannot even be described in detail over the radio. Both are likely to confront emergencies which endure, not for a few seconds like those of the highway, but for hours. Both have an immense range of decision, covering navigation as well as pilotage. Not only the handling of the controls and the speed of the ship, but the course steered over the earth's surface, can be varied. It seems fair to bracket the two, declaring them equal in weight of responsibility.

On the other hand, there are certain marked differences that would naturally affect compensation. The sea-captain takes much longer to qualify for high command but the pilot has to pay much more for his preliminary training (unless he gets it without charge from the Army or Navy). The officer in the merchant marine learns while he works. The sea-captain has to command a crew as well as a ship while the pilot needs no special qualifications as an executive. The sea-captain has many more lives and a much more expensive piece of property in his care, but the pilot has to shepherd his craft and its passengers through hazards which are, at present, somewhat greater than those of the sea. Incidentally, the pilot has to pay considerably more than the sea-captain for his life insurance, and his excess premium clearly ought to be added to the salary to which he would otherwise be entitled. The greatest difference of all, however, is that superannuation is likely to come swiftly upon the pilot on a transport line.

Piloting, and three professions with which it is often compared	Air transport pilot	Passenger locomotive engineer	Bus driver	Passenger ship captain
Length of specialized training required	1 year	None	None	None
Cost of training course (dollars)	5000–6000	0	0	0
Length of employment before taking command	5 years	10 years	2 months	10 years
Yearly salary during above period (dollars)	2400–3600	2100	1600	1980†
Yearly salary on attaining full rank (dollars)	5000–8500	2700–3000	2000	3600-up†
Pension provided after retirement (dollars)	None	776	None	900-1800
Additional insurance premium (dollars per M)	25	2	None*	None*

*Nothing extra, but in accordance with individual cases certain charges may be deleted.
†Plus found

How many years of flying?

No one is equipped to set a definite maximum age for regular flying, but Army and Navy experience suggest that it will be a very unusual individual who can safely keep a regular transport run past the age of 48. If he went to a flying school at 22 years of age, and found a regular flying job immediately after graduating, he would get 4,000 hours in the air and presumably be amply qualified to act as a regular line pilot by his 28th birthday. He would have twenty years of flying ahead of him at a first pilot's pay. Of course, only a small proportion of the graduates of flying schools will ever progress at any such rate. But only a small proportion of those who enter the merchant marine ever reach high commands. It is fair to consider only those who show particular aptitude.

In twenty years of flying, the pilot ought to be able to accumulate enough savings to provide for the future, and especially for a period of three or four years in which he may be picking up some new trade. Still further, he must receive a salary sufficient to pay returns on the rather heavy investment represented by his flight training in a commercial school. He is clearly entitled to all that in addition to whatever compensation might normally be paid for his services as such.

Of course the objection will at once be made that pilots need not retire when they no longer feel fit to fly a route daily, and that they will fit into other posts in the air transport companies. In a certain measure that is true, but the number of executive positions is limited, and it is unlikely, in the long run, that more than a third of the pilots can be taken care of in that way.

The pilot's pay

Without going into all the actuarial detail, it appears that the special factors in the pilot's position, and particularly the probable necessity of finding other employment at a comparatively early age in most cases and the necessity of covering the cost of a $5,000 training course, call for an extra compensation of some $1,800 a year. If it be assumed that training will very commonly be secured at Randolph Field or Pensacola, and if the cost of the investment in training therefore be neglected, the differential amounts to $1,050.

Seeking a basis of estimate for the compensation to be paid directly for services currently rendered, the best guide can be found remote from the field of transportation. The intellectual, moral, and physical qualities that are required in a transport pilot are probably about as rare, and therefore should on the average be as highly rewarded, as those that enable a man to graduate from a good technical school and land in the upper half of the engineering profession. Elaborate inquiries by engineering societies have indicated a mean income for such men during their most productive years, on the basis of a 1932 wage scale, of about $6,300. Adding the differential figure referred to above, the total salary that would, in the long run, be anticipated for airplane pilots comes to around $7,500 to $8,000.

All this is of course pure theory, and theorizing in the realm of compensation for services is dangerous business. Wages and salaries are commonly fixed by tradition, by collective bargaining, and by pure chance, rather than by analysis. Nevertheless there is likely to be some approximation to equity in the ultimate outcome where professional or industrial employments are concerned, and it is interesting to note that the figures just derived by analysis ($7,500 to $8,000) lie so close to the upper range of salaries now paid on the transport lines. The calculation is rough enough so that differences of a thousand dollars or so either way would have no particular significance, but the reasonable approximation to agreement with present practise at least suggests that there is no great probability of any general sharp revision downward of pilots' salary scales. At present, of course, the necessity of getting something for the family to eat and meeting the rent might force good pilots to work for whatever they could get, however little. The present condition is a transitory one, and over a considerable term of years it seems unlikely that men of the desired caliber will be drawn to and kept in the profession at materially less than the present rates of pay.

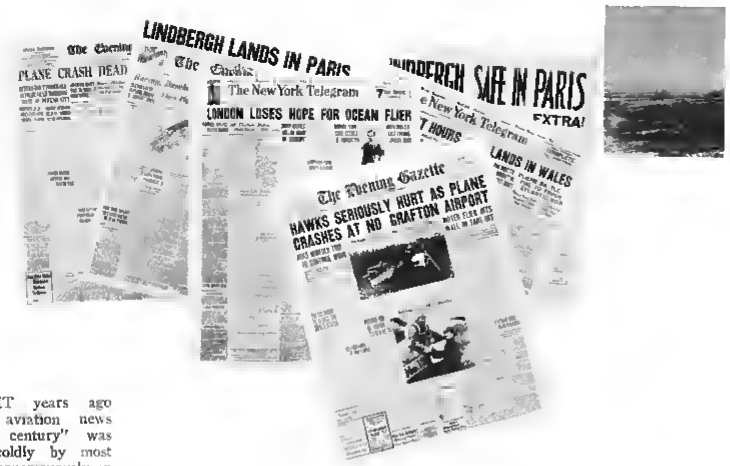
It is not apparent what considerations originally controlled the fixing of the salaries of the pilots on the government-operated air mail, but presumably they were connected with the salaries of Lieutenants in the Air Service, whence most of the personnel had come. Increased flying brought increased compensation, and at the time when the government went out of the business in 1927 a pilot with 2,000 hours on the mail, flying 800 hours a year with 35 per cent of it during the night, was getting $10,100. Most of the companies holding mail contracts have made only comparatively small reductions from the post-office scale. On one important line, in particular, a pilot with the experience and doing the amount of flying just referred to would now receive $8,300—a reduction of 18 per cent—probably somewhat less than the average reduction of income of those who were getting $10,000 incomes in American industry before the depression and who still hold the same positions. The line just referred to, however, is actually paying its pilots a larger fee per mile flown now than during the first year after the line was opened. That, to be sure, is not a universal rule. In a number of cases cuts have been made, ranging up to 20 per cent.

At the present time, American airlines divide into two general classes. The first, and the larger, contains most of the long lines and most of those that have mail contracts. The pay of their first pilots ranges from $6,400 to $8,500 a year. The second group includes most of the non-mail services, and especially those that make comparatively short runs over easy routes, where the pilots' schedules can be laid out to permit every man to spend every night at home and where the weather seldom shuts down suddenly to interfere. It is difficult to say how much money value the average pilot would consider such specialized working conditions to have, but the fact is that typical short lines have been paying from $4,000 to $5,500. The compensation on Century Air Lines, which was very well aired in the course of Congressional debates on the strike, was $4,200 a year.

Pay per hour, or mile

There was another unusual feature of the 1931 Century salary scale besides the fact that it was below usual practise. It was unique in that it was on a flat-price basis. In practically every other case, both in the United States and in Europe, the rule of monthly retainer-plus-so-much-a-mile has prevailed. The retainer starts at a minimum figure and increases with the acquisition of seniority, being stepped up either for each year of service or for every 500 hours flown. In Germany, at one time—it may still be true—seniority accrued only during a period of complete freedom from accidents, and the pilot who had any mishap with a ship had to go back to scratch at the minimum rate of pay. The mileage pay in most European countries is flat the same for all flying. In America it is often varied with the terrain flown over, and is almost always twice as high for night as for day flying. Under present conditions with night routes as well protected as they are and with the amount of bad-weather flying that has to be done, the two-to-one spread seems unduly large.

A change from a mileage to an hourly basis seems a very reasonable and a probable development, and has in fact already been made in some cases. The amount of flying that a pilot can do with safety depends much more upon time than upon distance and, although it inevitably costs more for fuel to keep a fast machine in the air for an hour than to fly a slow one of the same size for the same length of time, there seems to be no logical reason why it should cost more per hour for the pilot's services.



Front page!

A better perspective for the press on aviation news

By William E. Berchtold

Aeronautical Chamber of Commerce

TWENTY-EIGHT years ago the "greatest aviation news story of the century" was turned down coldly by most newspapers, printed inconspicuously in a few and displayed on the front pages of less than half a dozen. Today aviation is one of the chief sources of news—press association wires carry thousands of words on aviation each week. Some of it is constructive information on new technical or business developments in this fast growing industry, much of it is concerned with the latest spectacular exploits of fame-seeking pilots, and not a little of the news which makes the *front page* lends itself to screaming headlines that herald an "air disaster."

Hundreds of thousands of dollars have been paid by newspapers during the past five years to heroes of the air for their "personal stories" of some history-making flight. Eighty-seven newspapers in the United States, with daily circulations of from 15,000 to several million each, have aviation editors who devote a major share of their time to reporting new developments in this field. Hardly a newspaper, regardless of size, is without a reporter whose special interest in aviation has made him the office expert on the subject whenever there is a story to be covered or an argument to be settled.

It is a far different situation from the one which Harry P. Moore, then a 21-year-old reporter on Norfolk's *Virginian Pilot*, faced on a mid-December day in 1903 when he "scooped" the world on the story of man's first flight and found few editors who were willing to print his story. The chief response to his enthusiastic query to leading daily newspapers, offering to sell them the "great story," was a flat refusal to place any credence in the "fairy tale." Several managing editors of western dailies refused to pay the collect wire charges of Moore's query, although they amounted to only 22 cents.

The Virginia reporter's story was far from accurate on details of the flight, despite the fact that he tried to get the true story and hold his youthful imagination in check. Many another aviation reporter was to find it just as difficult to get accurate information on spectacular aviation achievements as well as disasters during the first quarter-century of flight. The natural reticence of the scientific mind unwilling to permit news of spectacular achievements to leak out before final proof was certain, together with the braggadocio spirit of the self-styled "air hero" of the pioneering era whose "dare-devil" flying stories furnished news for many years combined to make it almost impossible for the reporter to print facts.

The "stunt" hangover

Newspapers learned to distrust the sources of aviation news during the pioneering era, which extended well into the days of the first air mail after the World War. Reporters found that they had to discount the claims of some fliers, while the reticence of others led them to sensationalize minor incidents beyond their true merit. The stories of spectacular air combats between American and German aces during the war, dressed up in glowing terms by the government's war propaganda committee to buoy the spirits of patriots at home, led managing editors to examine every aviation story for its possibilities as a front page banner-line. The circus and stunt flying era, during which "dare-devil" pilots "risked their lives" as their stock in trade, produced its own share of spectacular hair-raising tales which found their way to the front page. Then the pioneering flights of the air mail pilots brought new stories for page one on their "battles with the elements" and crashes in the Pennsylvania mountains led to the coining of such terms as "Hell's stretch" and "the graveyard of aviators" to identify the rugged country of the Keystone State. News of trans-Atlantic flight after trans-Atlantic flight found its way to the front page from 1927 to 1931, and Lindbergh's achievement stirred the world to a flaming enthusiasm for aeronautics. Managing editors learned to expect big stories from aviation for their front pages, and accounts of important, but less spectacular developments had to be content with

The "greatest aviation news story of the century" was turned down coldly by most newspapers. Not very many years later aviation became one of their chief sources of news

obscure corners on pages 27 to 52. Circulation departments learned that newsboys shouting "Big Airplane Crash" aided street sales, and many an accident, often the result of an inexperienced pilot thrilling his friends in a home-made plane, found its way to the front page in flaming headlines. Every accident story was potential front page matter, whether it happened locally or 2,000 miles away and regardless of the prominence of the pilots involved.

During this period in which spectacular aviation news crowded the front pages of daily newspapers, a new transportation industry emerged. A great network of airways with new scientific aids to air navigation was established, and a new transportation service was offered a public which had learned to admire the achievements of aviation, but had been fed on a daily newspaper diet of spectacular flights by "supermen" and on not a few stories of sensational airplane crashes. Some of the first publicity efforts of airline press agents—harassed by their superiors for failure to make the front page—tried to outdo the publicity-wise stunt flier in their methods of manufacturing front page news. The result could hardly be expected to inspire the business man or conservative pleasure traveler to use this new transportation system. Yet the airlines continued to build up impressive operating records for safe and reliable transportation. Such stories could hardly compete with spectacular ocean flights for front page space. Not that they lacked interest, but their news value could not compare with the exploits of the latest "air hero." The newspaper editor, like the wise merchant, placed his most saleable stuff in his front window—the front page.

The hush-hush policy

Instead of building up a close liaison between aviation and the press, uninformed airline employees adopted the thread-bare policies of the railroads during their pioneering days, hastened to "cover-up" unfavorable news, and went so far as to confiscate news photographers' cameras and to bar reporters from the scenes of airplane crashes. Such policies, usually the result of individual initiative in the absence of specific instructions and under the strain of an emergency, reacted as boomerangs, injuring the reputation of the lines and resulting in the playing up of minor accidents as sensational stories.

Reporters long ago learned that covering an aviation story—and particularly an aircraft accident—is one of the most difficult tasks in news reporting, even when everything is favorable. It is little wonder, therefore, that so many inaccuracies find their way, almost daily, into aviation news stories. The vocabulary of the industry alone has grown so rapidly that editors on news desks have been given a real task to keep abreast of it. The temptation which faces the rewrite man when a reporter telephones him a story of an "air hunt" for a "lost flier" is so great to turn a trivial incident into a sensational front page story that he must constantly check himself to keep within the bounds of accuracy and fairness.

When all elements are considered, it is really remarkable that most newspapers are doing such an excellent job of reporting aviation news to give their readers a true picture of this rapidly growing industry. Volumes might be written on the great service that the newspapers have afforded aviation in keeping the public informed. Yet the very character of news which gets the reader's first attention—that on the front page—is such that the average man is apt to get a lop-sided view of aviation. Some newspapers, whose editors' mental attitude toward aviation is still in the era of circus and stunt flying,—when *every aircraft accident was front page news*—are unwittingly hurting the normal development of this new industry by playing up all aircraft accidents regardless of their importance or local interest. Less than 7 per cent of all aircraft accidents, including even minor ones, are on the scheduled air transport lines. But few readers distinguish between the few accidents in this rapidly growing branch of aviation and the hundreds of miscellaneous accidents, many of which are the result of inexperience or inadequate equipment.

Every survey of the aviation industry that has been made in the last four years points to expense and fear as the two greatest deterents to more widespread use of air transport. A general downward revision of fares during the past two years, to rail-plus-pullman or even lower levels, has certainly met the expense objection. *Fear*, stimulated principally through impressions gained from daily newspapers and not wholly justified by the facts of air transportation's safety, remains.

A new approach

It was with this background of facts that the major air transport operators in the United States turned last summer to consideration of a plan for obtaining a greater consciousness of air transportation's chief problems among newspaper editors and publishers. Several editors, who had been presented with the facts about air transport and asked to consider the far-reaching consequences of their sensational treatment of accident news, admitted frankly that their mental attitude toward aviation was not consistent with the facts. The few who were reached by responsible representatives of the industry suggested that the air lines undertake to discuss the facts of air transport with editors and publishers throughout the country.

The editor of a West Coast daily, who admitted his judgment was poor when he used a banner-headline on a minor

That newspapers and airline operators might see each other's point of view, the Transport Committee of the Aeronautical Chamber of Commerce has conducted an extensive campaign of advertising and contact work. Advertisements, addressed to newspapers, were followed up by letters and personal calls. Evidence of good results is furnished by more rational treatment of recent accident stories in the daily press.

accident resulting in the injury of a mechanic when he might have selected the fall of the Spanish throne or the President's veto of a bill vital to every reader, made the direct suggestion that the industry call on every editor and publisher in the United States as he had been called upon. Obviously, this would have been an expensive and almost endless task. The plan which was devised by the operators through the Air Transport Section of the Aeronautical Chamber of Commerce was designed to be as effective

First, every air transport line represented in the Chamber made certain that its personnel understood the instructions of its principal executives concerning relations with the press, particularly on the handling of accident news in emergencies. The general practice was to instruct all employees to notify immediately the air line's division or local traffic manager of any accident or news development, the traffic manager being held responsible for taking the initiative in contacting local newspapers and press associations to give them complete and accurate information and to assist in every way possible. Immediate reports to headquarters also were ordered. All employees were cautioned *not* to give out rumors or theories as fact, but to keep the press informed of every development as facts became available. Several lines are now engaged in instructing their local representatives in each city to contact managing editors and city editors of local papers and furnish complete information as to where the lines' representatives may be reached night or day on any matter concerning the company. This was the result of a suggestion made by an editor after the campaign had been started.

Advertising messages

For six consecutive weeks, beginning Sept. 19, the Air Transport Section of the Chamber inserted full-page paid advertisements in the leading trade publication of the newspaper field, *Editor and Publisher*. Each advertisement in the series unfolded a part of the aviation industry's message to editors and publishers on the chief problems facing air transport, particularly with relation to aircraft accident publicity. Based on the premise that "millions must fly on the air transport lines before thousands constitute a market for private planes," the advertisements were addressed to the newspaper on behalf of the entire aviation industry. The series presented facts on the growth of aviation, particularly scheduled air transport, gave up-to-date statistics on the safety of air travel, cited figures on the reliability of the air mail, expressed the industry's faith in the importance of newspaper advertising as a medium for developing business, lauded the efforts of those newspapers which strive to furnish readers with a true picture of aviation as an industry, and pointed to the devastating effects of over-dramatizing accidents by displaying them on the front page almost without regard for reader interest. Excerpts from one of the advertisements—the fourth in the series—will indicate the tenor of the message.

"We realize that accident reporting of any kind is difficult. Reporting of aircraft accidents requires even greater skill and more faithful attention to details if the facts are to be presented accurately and without sensationalism. Accidents on the regular air transport lines, with which the public is directly concerned, are rare. However, even with the most careful reporting, the facts are apt to be distorted. Often statements are made by uninformed bystanders which from a technical point of view are absurd. The various conflicting accounts offered following a crash befuddle the public mind; and even after the truth is published, some 'theory,' printed in haste to make early editions, remains as the average reader's concept of the happening."

A definite system for obtaining accurate information from airline officials in an emergency was described, and reporters were asked to check whether the plane and pilot are licensed, whether the pilot is a student or novice, and whether stunting or some other dangerous practice was a cause.

A paragraph or two from the fifth of the series might be interesting:

"Newspaper advertising is widely recognized by the great steamship and railroad lines as a vital need in promoting new business. Likewise the great network of air transport lines now in successful operation must turn more and more to newspaper advertising for presenting their services to the American public. But if this advertisement is to be effective and not encounter unwarranted prejudice of Fear (the most formidable sales resistance) it must reach a public which has not been confused in its understanding of the safety of air travel.

"We ask for no suppression of legitimate news. When a passenger fatality occurs on a scheduled air transport line (which is a rare occurrence), we realize that this deserves the same attention as an accident of similar proportions in

One of the Chamber's series of educational advertisements directed at the newspaper editor. Letters and personal contacts supplemented their appearance.

another branch of transportation, and fully understand that it is news.

"But we do ask that in presenting aviation news to your readers, a distinction be made between the accidents that occur on the scheduled transport lines and those of a wholly minor and local significance which occur when reckless individual fliers come to grief through their own inexperience or lack of judgment.

"Over-dramatization of these minor fatalities largely tends to distort the public's understanding of the safety of air travel as it exists today, and to that degree vitiates the advertising which responsible lines may be purchasing on another page of the same newspaper. This is unfair to the air transport industry, which has a merchandising problem just as do railroads, steamship lines, travel groups, banks, food products and other advertisers. It is unfair to the publisher who has presented aviation accident news fairly and is not a party to the over-dramatization which has tended to make the public fearful, and which in turn retards the logical growth of air lines that wish to do more advertising as the public responds to this new form of speedy travel. It is also unfair to newspaper readers in causing them to hesitate to avail themselves of a splendid, dependable service built up for their benefit . . ."

In each advertisement, the Chamber offered its services to the newspapers and indicated that a copy of "The Aircraft Year Book for 1931" would be sent with the industry's compliments to any editor or publisher requesting it for his personal use. More than 250 requests from 146 different cities in 40 states were received—practically all of them from the chiefs of leading newspapers—and many of the letters commented on the value of the industry's "level-headed" campaign as a means of bringing aviation and the press together on a better ground of understanding. more than two-score editorials are known to have been written on information obtained in the advertisements, concerning the increased safety of air travel. It would be impossible to quote many of the comments or editorials here; suffice it to say that all were intelligent, sympathetic, and highly favorable to the educational campaign.

Sympathetic response

Similar letters came in from scores of editors, publishers, managing editors and city editors. To make certain that the series attracted the attention of all editors and publishers of leading newspapers, Charles L. Lawrance, president of the Chamber, sent a letter to every editor and publisher of newspapers in cities served by the air transport lines, requesting that they turn to page two of their copy of *Editor and Publisher* and read the industry's message. Upon the conclusion of the six weeks' advertising campaign, complete sets of the six advertisements were sent in a special envelope with a letter from Mr. Lawrance to every editor and publisher.

Before the advertising series was completed, we started out to make personal calls on the editors, publishers, and managing editors of leading daily newspapers in the East, Midwest, and South to get a cross-section of opinion on the effects of the industry's message, and as a further means of carrying the campaign directly to key editors. Everywhere the Chamber's message was received with genuine cordiality. At least one-third of the 49 newspapers in fourteen major cities visited on this first trip had one or more of the series of advertisements posted on bulletin boards for the information of their reporters. Several editors had made such notations as "Watch these points closely" and similar instructions to their staffs. The editor of a leading Ohio paper adopted a definite policy on playing aircraft accident news: (1) never to group or pool accident stories in one column or on one page; (2) never to use an aircraft accident on page one unless of unusual local significance; and (3) never to permit the use of a streamer or banner-line on any aircraft accident story except with the special consent of the publisher.

The editor of a leading Kentucky paper compared the aviation industry's problem to that of the banking business during the present economic crisis, pointing out that if the dozen scattered bank failures which have been occuring every day for the past year in the United States were pooled in a single story and displayed on the front page of every paper in the country for a single week, the nation would soon face the greatest panic in history, despite the fact that the banking business as a whole is sound. Analogously, he said that it is just as unfair to the sound air transport lines to pool relatively unimportant accidents in a single story and place them on the front page. Like many other editors who have considered the problem, he has forbidden the pooling of accident stories or their use on the front page, unless the story has unusual news merit.

The newspapers visited on our first trip have a total daily circulation of more than 10,000,000 and include such important cities as Cleveland, Detroit, Chicago, Kansas City, St. Louis, Memphis, Nashville, Louisville, Cincinnati, Columbus, and Pittsburgh. Another trip followed, with calls on editors and publishers of the Southwest, Rocky Mountain States, Northwest, and West, reaching newspapers in twenty widely scattered centers from Dallas to Portland, Los Angeles to Butte.

It is interesting, in conclusion, to learn the attitude of the industry as a whole on the importance or value of this undertaking. When Mr. Lawrance invited comments and criticisms from leaders of the industry, he received more than 100 letters. All expressed appreciation for the work that was being done. Many reported evidences of improvement in the attitude of certain newspapers since the campaign was undertaken. Executives of the aviation industry and leading editors interviewed agree that this is a vital problem which can be solved only by building up a close liaison between the industry and the press through an interchange of ideas over a period of years. The groundwork is being laid for such a relationship through the work which the Air Transport Committee is directing.

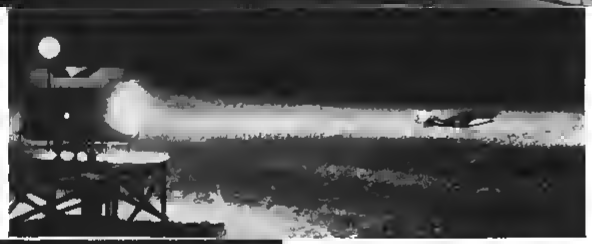
The editor's viewpoint

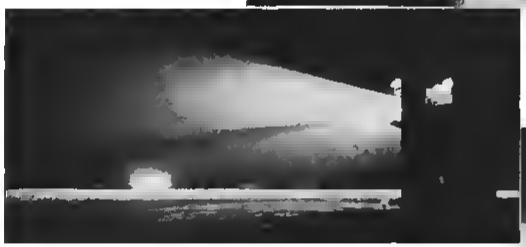
Here are a few of the impressions which we have received through the personal visits with editors and publishers: (1) that newspapers generally are more than anxious to be fair in their treatment of accident news; (2) that the outstanding cases of unfair sensationalism and inaccuracy in the past have been due to a lack of knowledge of the facts of air transport; (3) that the leading press associations originate and distribute the greatest volume of aviation news stories printed in daily newspapers; (4) that not more than one out of every five editors and publishers have actually flown on the scheduled air transport lines; (5) that unfortunate incidents in which pilots or aviation officials have failed to show proper courtesy to newspapermen covering accident stories have caused a major share of the ill feeling which exists in the minds of a few editors; (6) that these editors and others welcome the efforts being made from within the aviation industry to improve relations with the press through a greater understanding of the newspapers' problems; (7) that publishers look forward to the time when air transport lines and aircraft manufacturers will become important advertisers but are quick to realize that unfair accident publicity is only delaying that day; (8) that relatively few of the "top men" of the leading newspapers had been called upon previously to consider the problems and progress of this new industry.

Much of the work which remains to be done must fall upon the shoulders of the major air transport lines, because scheduled air transport is the natural entering wedge in the education of the general public to the value and utility of aviation. The cooperation of every person and company affiliated with the aviation industry must be obtained, however, to establish a close liaison with the press, because the actions of a single irate private flier who may punch a newspaperman in the eye can undo the good work of scores of companies within the organized industry. The major air transport lines, all members of the Air Transport Section of the Aeronautical Chamber of Commerce, are pledged to a program to do their part.

St. Louis News Service

Above: The even illumination of this Sperry-AGA unit at Lambert St. Louis field is discernible by a view from the above angle. The light is in the right. Right: A General Electric installation at Tampa. This is the ALH type housing multiple units each focussed on a different segment of the field. Below: One of the two Sperry-AGA units at Floyd Bennett Field, New York City.

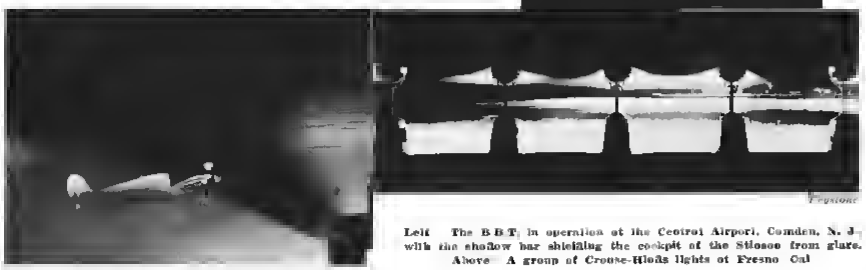




Below: Behind a battery of Westinghouse lights at Newark Municipal Airport, which were designed to cover two intersecting runways at the New Jersey port.

Airport lights

Typical installations that aid night operations



Left: The B.B.T. in operation at the Central Airport, Camden, N. J. with the shallow bar shielding the cockpit of the Stinson from glare. Above: A group of Crouse-Hinds lights at Fresno, Cal.

The S.A.E.'s design session, held at Detroit during the show

Load factors on airplanes

TWO PAPERS

THE S.A.E. meeting at Detroit devoted only one session to airplane design this year, most of the time being given to power plants, to maintenance problems, and to navigation. In the design meeting stress analysis displaced aerodynamics as the order of the day, and papers were presented on the specification of airplane load factors and on the application of photoelasticity to the solution of indeterminate stress problems in aircraft structures. The editor of AVIATION was responsible for the first, Prof. D. L. Pellett of the University of Cincinnati for the second.

Mr. Warner's paper was a further contribution to the rationalization of load factors, which have so far been very largely empirical or determined directly by flight experiments. Only to a very limited extent have the loads on the airplane structure been traced through in detail from an original specification of flight conditions. The United States have had a very low rating on consistency and logic in load factor specifications in the past, but immense progress has been made in the last couple of years as the result of work done by Mr. Rhode and others at Langley Field, of certain basic studies by the Army and Navy, and particularly as the outcome of discussions at the aeronautic industry's meeting with the Department of Commerce last summer and of subsequent investigations by the staff of the Aeronautics Branch.

To be strictly logical, Mr. Warner declared, no load should ever be specified directly. The specification should always be in terms of flight conditions. He suggested that all the flight conditions capable of producing really serious loads on the structure as a whole could be grouped under four headings:

(1) A straight vertical dive.

(2) A sharp pull-up from a dive at high speed.

(3) Nosing over sharply while flying at high speed, or diving, as in starting an outside loop.

(4) Flying in bumpy air.

Other conditions are of course of some localized importance. A roll, for example, may impose serious loads on the wing tips and on the center section bracing, but the four conditions enumerated cover all the cases likely to correspond to the maximum load factors on wings and fuselage, as load factors are at present defined and specified.

Some sub-division of these conditions was of course necessary. Many different load conditions exist successively during a sharp pull-up from a dive, for example. In the particular case the author proposed three subdivisions, thus:

(a) Condition of maximum loading on the horizontal tail surfaces, usually arising approximately at the instant when the pilot has exerted the maximum force on the stick—from 0.3 to 0.6 sec. after the rearward movement of the stick is started.

(b) Condition of maximum wing loading arising at an instant just before the wings attain the maximum angle of attack reached during a maneuver or just before reaching the angle of maximum lift, if that angle should be exceeded at any subsequent time. It may be from 0.5 to 3.0 sec. after the rearward movement of the stick is started.

(c) Some condition intermediate between (a) and (b), corresponding to the most severe combined tail load and dynamic load on the fuselage.

Estimating diving speed

The calculation of loads in a vertical dive is a relatively straightforward matter, and the paper went into no detail except on the determination of diving speed. It was demonstrated that a general formula for terminal speed in a vertical dive can be developed in very simple terms, following the principle used in securing the maximum speed formula in miles per hour in Warner's "Aerodynamics" [See also "Calculating Maximum Speed of Airplanes," by E. P. Warner and S. P. Johnston, in AVIATION for January, 1931, page 55.] For airplanes of average present-day cleanness of design the limiting speed of dive becomes $V_t = 96\sqrt{(W/S)}$, where W and S have their usual significance of gross weight and total wing area. For a machine of exceptional cleanness, such as the fastest military ships, certain racing machines, and some of the high-speed transport monoplanes, the coefficient in the formula may attain a value as high as 118.

Of course the largest and heaviest airplanes are not likely to be subjected to vertical dives to terminal speed, and cannot be expected to stand that speed. Mr. Warner proposed that, as in German practice, there should be a specification in terms of the maximum angle of glide which might be indefinitely maintained up to terminal gliding speed. He further recommended that that angle should be 45 deg. on planes of 3,000 lb. weight or less not intended for acrobatic service, decreasing steadily to 20 deg. on planes of 12,000 lb. weight or more. All planes designed for acrobatics should of course be required to stand the terminal vertical dive.

The next question treated, and a far more complicated one, was that of recovering from a dive. The dive itself throws the maximum torsional load on the wing structure, but it is in the course of recovery that the rear truss and the front truss may individually experience their largest loads, and that the tail surfaces and fuselage also are subjected to the most severe conditions that they have to stand.

It is of course universally recognized that the largest possible load on an airplane would arise if the machine were dived vertically to terminal velocity and then pulled up so abruptly that the angle of attack corresponding to the maximum lift is reached without perceptible drop in speed. Using the formula already derived from maximum

speed of dive, Mr Warner showed that the theoretical maximum load factor obtainable under those conditions would be independent of all the qualities of the airplanes except aerodynamic cleanness, and would range from 32 for a design of average fineness up to 48 for one in which extraordinary care has been taken with the reduction of parasite resistance Obviously such factors exceed both the structural capacity of any airplane that has ever been built, or of any that can be built and still have a seasonable performance and a margin of lifting power for commercial and military load, and the physical capacity of the pilots Experience shows that factors as high as 8 or 10, applied even for a very brief time, are likely to be physically harmful, and a factor as high as 20 would almost certainly result in serious injury of a lasting nature. It is plainly necessary to assume that the pilot uses some discretion in recovering from the dive

Easing out of a dive

The factor of discretion is a somewhat vague one It may be written in terms of the limiting angle to which the pilot will pull the elevators during recovery, of the limiting load factor that he will sustain on his own body before easing off on the controls, or of the limiting force that will be applied on the stick. Mr Warner selected the last named of the three possibilities, as the most direct and most likely to apply generally in practice. Both of the other alternatives, however, found defenders in the course of the discussion that followed the paper.

The paper suggested that it is very unlikely that a maximum stick force of 100 lb would be exceeded during recovery That was a large enough force so that it could not be applied without the pilot's bracing himself with his feet for the pull. Even under conditions of great stress and emergency the 100 lb figure would be unlikely to be exceeded without the pilot's realizing that he was doing something abnormal and dangerous

Taking that as a basis the author proceeded to calculate the load factors that would be encountered under various conditions, adopting a fundamental method developed by Messrs. Gates and Howard in England and then simplifying the results by using his own approximate performance formulas to throw them into terms of the most general fundamental characteristics of an airplane. The resultant curves are shown in Fig 1, the dotted lines representing non-acrobatic airplanes and based on the assumption that in small machines not intended for violent maneuvering the maximum stick force would drop off from 100 lb to as little as 40 lb in a 1,000-lb ship The author believed it inconceivable that a force of more than 40 lb on the stick would be exerted by the pilot of a light plane unless he were deliberately bent on wrecking the airplane

Mr. Warner then went on to analyze the effects of certain particular changes in design characteristics. Other things being equal, the possible load factor after a dive increases with increasing wing loading, varying approximately with the square of the wing loading. It varies inversely as the square of the weight for a given loading Rather surprisingly at first sight, but quite logically on further examination, it develops that the load factor is increased by reduction of the ratio of the tail surface area to wing area. It is increased, also, by reducing the size of the elevator in proportion to that of the fixed stabilizer Most important of all, however, is the effect of balanced elevator control, which may increase the theoretical load factor under some conditions to as much as four times the values plotted in Fig. 1. The author suggested that balanced elevators on large airplanes constituted a definite hazard unless the pilot bears the lightness of the control always in mind and uses it with extreme discretion in recovering from a dive, or even in pulling up from high speed level flight.

Stresses in bumpy air

For small airplanes, and those intended for use in acrobatic flying, the condition of recovery from a dive is the most serious that ever has to be encountered For most commercial types the loads encountered in flying through rough air may be still more serious

In analyzing the rough-air conditions the author of the paper used two methods. The formula offered by Mr. Rhode in his paper given before the S.A.E last year [AVIATION, May, 1931] was applied to show the effect of encountering a gust having a vertical velocity of 30 ft. per sec. Another calculation was made by a slightly different method on the presumption of a vertical gust of unlimited velocity (all velocities of over 60 ft per sec. are likely to have about the same effect). such as may be encountered in a line-squall or thunderstorm The load factors resulting from the two conditions were put in terms of wing loading and power loading, again by use of the familiar performance formulas, and plotted as two families of curves. The resultant diagram is reproduced herewith as Fig 2

Mr Warner proposed that every airplane should be able to stand a vertical gust of unlimited velocity with a true factor of safety of one, and that the true factor of safety in normal bumpy air, with vertical currents of velocities up to 30 ft. per sec., should be at least 1 5 Taking the difference between those factors of safety into account, it still appears from Fig. 2 that the line-squall condition is the critical one in every case except for very light wing loadings and high power loadings, a combination seldom existing in modern design except in light planes. In no case does the "normal" gust provide the critical condition with wing loadings of over 8 lb. per sq ft.

The author's general conclusion was that the work had not yet been carried far enough to justify the preparation of a general table of load factors, but that it appeared that the tendency in past specifications had been to over-emphasize the importance of gross weight and power loading and to under-estimate the significance of wing loading in determining stresses.

The general indication, from the comparison of Mr Warner's charts with the present Department of Commerce specifications, was that the present load factors vary somewhat too rapidly with power loading, calling for excessive strength for machines of high wing loading and high power and for factors of rather questionable adequacy for lightly-loaded planes of light weight and with low-powered engines. For the heavier planes, on the other hand, the present general form of the curves in Bulletin 7-A of the Department of Commerce seemed very reasonable The investigations in the paper led to high-angle load factors approximately the same as those obtained by the Department of Commerce for a plane of 5,000 lb weight For larger planes Mr. Warner found larger factors than those recommended by the Department, and was disposed to suggest that there should be no reduction in high angle load factors after reaching a gross weight of from 6,000 to 10,000 lb Bulletin 7-A continues the reduction up to a 25,000 lb gross

Since steady flights with bumpy air appeared to provide the limiting conditions for practically all machines of above 6,000 lb weight, it would follow that the load factors should be identical for all machines of over 6,000 lb and of equal power loading and wing loading

Rear truss loads

The paper dealt much more briefly with the so-called low-angle load factors, those which impose the maximum load on the rear truss Mr. Warner concluded that it was impossible to get a true load factor on the rear truss of more than 1 5 in flying at maximum speed in bumpy air, and that the condition of recovery from dive was almost always the critical one He suggested, therefore, that the present low-angle load be abandoned entirely and that loads on the rear truss should be specified in terms of those existing during the steady dive, or of some specified diving moment coefficient on the airfoil at the speed corresponding to that of limiting steady dive This, perhaps the most radical suggestion brought forward, unfortunately attracted little attention during the discussion, as the experts on stress analysis in the audience had had no opportunity before the meeting of studying the paper and making their own calculations on what its recommendations would mean.

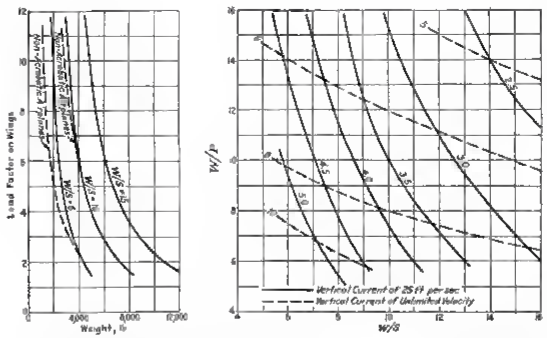


Fig. 1 (left): Load factor on wings in recovery from a vertical dive with 100-lb. force on the stick. The drop in load factor with increase in weight is startling. The curves are based on the assumption that the area of the horizontal tail surfaces is 15 per cent of wing area, the aspect ratio of tail is 4, the ratio of fuselage length to square root of wing area is normal and that elevator control is unbalanced. These relations are likely to be different in large airplanes

Fig. 2 (right): Wing load factors for airplane encountering vertical air currents The airplane is assumed to have customary design characteristics to be flying at maximum speed, and to encounter a vertical current having a velocity of 30 ft per sec and one of unlimited velocity

Criticism from the audience

Opening the discussion, Prof. J. S. Newell, of the Massachusetts Institute of Technology, author of a paper on a similar subject presented at the Cleveland meeting last fall, questioned the desirability of specifying dive recovery in terms of a constant stick force. He thought the elevator angle a better measure, if only because physically absurd results were obtained by using the stick force when the elevators were very nicely balanced He further suggested that stick force specifications would become meaningless when servo-controls were used.

Mr Warner agreed that the angular motion of the elevators must be taken into account as a factor in some cases, especially in those mentioned by Professor Newell. In general, however, he felt that that angle was less satisfactory as a measure than force, since the specification on force could apply at all speeds and under all conditions, while one on angle could not possibly do so. It might be expected that a pilot would never under any conditions exert a force of more than 100 lb. on the stick, but the permissible elevator angle and the rapidity of elevator motion would vary with the conditions The elevator might be pulled hard up for landing, or in starting a zoom at moderate speed, yet a motion of two or three degrees would be structurally dangerous on the same plane in recovering from a fast dive. Furthermore, the motion of the stick in coming out from the dive was so small that the pilot could hardly be expected to be sensible of small variations in that motion. He certainly could not start with a determination, for example, that he would not move the stick more than 1½ in. while the speed was above 200 m.p.h, as he had no way of measuring the distance.

Ralph H Upson disagreed both with the author of the paper and with Professor Newell Using the analogy of the automobile, on which he believed that a typical driver governed by rapidity of turning a corner by the feeling of acceleration load and of incipient skid, Mr. Upson suggested that the load factor was the main element, and that the pilot should have instrumental means of determining the load factor or the angle of attack of the plane. The physical sensations, he thought, would in themselves give him some index of load factor.

The author agreed that there was much weight in those observations also, but felt that in an emergency the pilot was unlikely to be watching an instrument to see how the load factor was behaving, and might not be conscious of increasing pressure of his body against the seat in time to act in relieving the load until it was too late The pilot's sensations of load factor were undoubtedly the major element that guided him in pulling out of a high-speed dive in a pursuit plane or dive bomber, but on commercial planes, built to much lower load factors, Mr. Warner thought it unlikely that that sensation could be relied on to operate with sufficient delicacy to be a safeguard

Soaring flight on tri-motors

Mac Short, chief engineer of the Stearman Company, wanted to know more about bumpy air and the structural and other effects of rising currents. An official of one of the leading transport lines had recently told him of an occasion on which the plane climbed at 1,000 ft per min with the engine fully throttled Mr Short would like some advice for the pilot to follow under such conditions, in order that the load factors might be kept to the minimum. Mr. Rhode, of the N.A.C.A, leading expert on gust stresses, admitted that he had no advice for the pilot He thought things happened too rapidly for the pilot to do anything about it. Referring to the gust loads charted in the paper, Mr. Rhode urged the importance of dynamic over-stress, due to the sudden application of the load and to the inertia of the wings themselves. Some German experiments indicated to him that the actual load factor on the wing truss might exceed the accelerometer reading by as much as 70 per cent in rough air

Mr. Warner agreed on the possibility propounded by Mr. Rhode, but thought it a rather exceptional one He believed that in most airplane structures there would be enough damping by friction between the members so that dynamic over-stress would be a comparatively small factor,—especially since gust loads were never applied absolutely instantaneously.

T. P. Wright of the Curtiss Company, chairman of the session, and Comdr. R. D. MacCart, of the Navy Bureau of Aeronautics, both raised the question of taking account of wind gradients which have the effect of a horizontal gust during a dive and produce sudden changes in the angle of attack. Mr. Wright called attention to the fact that the condition of a suddenly changing wind superposed on a dive is considered rather important by the services The author of the paper had no specific data on the point, but believed that such an effective horizontal gust velocity as 30 ft. per sec., the figure suggested by Mr. Wright, would be extraordinarily rare Commander MacCart, speaking from actual experience in applying such a load specification, thought that the assumption of an effective horizontal gust velocity of 30 ft. per sec. during a dive was very necessary He went further, for Navy practice required a true factor of safety of 1 35 based on the yield-point, under those conditions. The final effect upon the structure, Commander MacCart said, was roughly equivalent to an inverted load factor of 4 on the wings.

Mr. Gazley, chief of the engineering division of the Aeronautics Branch, ex-

pressed the interest of the Department of Commerce in the subject, and their desire to continue the researches that they had inaugurated some months ago and to take account of the proposals brought forward in the current paper and of all the suggestions that could be secured from any other source.

Photoelasticity

Professor Pellett's paper on photoelasticity can hardly be abstracted, as it consisted mostly of an explanation of the laboratory technique, with some demonstrations on a portable apparatus brought into the meeting. Professor Pellett had applied the photoelastic method to the analysis of stresses in a truss rib. The results, tabulated in the paper for two load conditions corresponding to the two specifications imposed by the Department of Commerce for rib loading, did not differ very greatly from those obtained by graphical analysis on the assumption that the rib truss is a pin-jointed structure.

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The Pennsylvania Aero Club

THE Aero Club of Pennsylvania has demonstrated that such an organization may occupy an important position in the aeronautical activities of a community and can maintain that effectiveness over a long period of years. Though organized in 1909, the club is still going strong and now has 256 members. Its program is administered from permanent headquarters on the street floor of a building in the heart of Philadelphia under supervision of J. H. Witherow, full-time secretary, and his assistant.

The Aero Club seeks to participate in the promotion and supervision of all important activities in the city and the state. It has cooperated in formulating rational aeronautical legislation in Pennsylvania, has provided courses for club members, sponsored sporting events, and in other ways served aviation local affairs.

In the club headquarters are the executive offices, information bureau, library and reading room, and facilities for sale of tickets on all airlines. The information bureau, available to the public without charge, provides information on air routes, schedules and rates, various aspects of the aviation industry, local air activities and the work of the club. The services of the club personnel are at the disposal of the members for any purpose dealing with aeronautics.

Activities

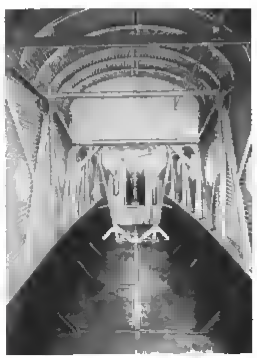
In the spring of 1930, in cooperation with the Aero Club of Pittsburgh, another successful institution, the Aero Club of Pennsylvania sponsored a state air tour which attracted 25 planes, covering all sections of the state and practically self-supporting. Each Autumn the club conducts a series of weekly lectures by prominent persons, such as Col. Clarence M. Young, Bernt Balchco, Paul Henderson and others. A year ago the club organized and conducted free of charge an elementary school course on aviation for boys and girls. It was regularly attended by approximately 100. In cooperation with the Philadelphia Playground Association, it has sponsored the Philadelphia Model Airplane Association, composed of several thousand boys and girls. The club supplies officials for the contests in this group. It also encouraged the extension department of engineering of Pennsylvania State College to establish an evening school in aeronautical engineering. The club undertook the publicity and the registering of students.

During the 1931 session of the state legislature, the Aero Club, through its legislative committee, served as spokesman for the aeronautical interests in the southeastern section of the state. Bills introduced in the legislature affecting aeronautics were recorded, and their progress closely traced. The club was instrumental in securing simplification of the state aeronautic law.

Of course, the club cooperates fully with the aviation divisions of civic and service associations, securing in this way much valuable publicity for local aeronautics. Members are kept in constant contact with activities through a monthly news bulletin, and a year book. Meetings of both the club and board of directors are held monthly and luncheons each Wednesday. Constant activity is thus maintained.

The Annual Sportsman Pilot's Race sponsored by the Aero Club attracts fifteen to twenty pilots each year. The race is a handicap affair based on actual top speed of the planes determined by test flights the day preceding the contest. Trophies are awarded for first, second and third position. Organizations desiring to conduct air meets in the metropolitan Philadelphia area, are requested to submit complete plan meets to the club for its approval, following which if it is sanctioned by the National Aeronautic Association, hearty cooperation by the club members is given. Experienced officials are made available. Another evidence of interest in the non-professional activities is the program of week-end cruises to points of interest.

The club is supported by dues from the three classes of members—active, sustaining and patrons, paying $10, $25 and $100, respectively. The full-time secretary's salary is underwritten by three of the leading members. A small income is derived from commissions on sales of airline tickets. This, so far, has been very small, but is expected to become a substantial amount with the expansion of the ticket business. Any individual over eighteen years old is eligible to membership. Of the membership, however, one-third are sportsman pilots, one-third are active in commercial aviations and the balance are interested in aviation with no professional connection. There are no social or financial restrictions incorporated in the club's by-laws; however, application for membership must be approved by the executive committee.



Interior of the Ford Freighter

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Freight carrier

THE interior accommodations of the Ford Freighter (AVIATION, July 1931, page 434) offers striking contrast to the luxurious appointment found in the modern transport airplane. Here has been no makeshift attempt to convert an airplane to a good carrier by the mere removal of seats, but the machine has been designed from the beginning as a freighter. Its interior arrangement stands in the same relation to the passenger transport as does the railway express car to the pullman. The accompanying photograph is of interest not only to show a cabin stripped down to the barest necessities, but because of the details of the Ford all-metal construction ordinarily concealed.

Ground operation at American Airways' Newark terminal.

Qualifications and training for airline service

Radio and its personnel

By Myron F. Eddy

THE increased use of radio in aviation activities has created a very definite place for a specialized radio personnel. Airports want radio operators versed in meteorology; transport lines want operators who are good all-around mechanics. Minimum requirements have been laid down by all major transport companies. To be considered at all an applicant for any aviation radio job must have a commercial radio operator's license, at least a high school education or its equivalent, and be of good character.

After employment, radio men must be prepared to specialize on radiophone or code, but they must be on the lookout for opportunities to extend their usefulness by training themselves for new activities. It is probable that within a few years many of the business airports will be equipped with radiophone sets for control of traffic, as is being done at Cleveland now. Very likely the airport radio operator would also have to be a teletype operator, be able to maintain both the airport radio set and those of visiting planes, and also take weather observations and make up reports. He should also have a fair knowledge of the business of flying. If, in addition, he is an aviation mechanic, so much the better.

Commercial radio operators' licenses are issued as extra first class, first, second and third class. Each is valid for two years, and can be repeatedly renewed for the same period providing a certain amount of prescribed work is done by the holder during their active life. The third class license is comparatively new. It was authorized in December, 1930, and is for *aircraft only*. A proficiency of only fifteen words per minute sending and receiving plain English is required, together with a comprehensive knowledge of radio regulations, tube transmitters and receivers. For second class, twenty words English as well as sixteen code groups are required, with the theory of arc and spark sets in addition to tube sets. This qualifies for marine work as well as aviation work and is the lowest class issued to ship's operators. The first class and extra first class are gained by experience and operating speed.

It is easy to see that a good engine mechanic who acquires a third-class operator's license might be more desirable to a transport company than an extra-first-class operator who knows nothing of aviation or engines. In most cases a graduate of a good aviation ground or mechanics' school who qualifies as a third-class radio operator will prove of more value to a transport line than an old time sea-going operator with a lot of speed. This doesn't always work out, but one thing is certain—speed in sending and receiving is not necessary when operating a plane set, while aptitude for flight work is an absolute essential. An old-time ship's operator who is a little nervous in the air is not as welcome as a green young aircraft radio operator who loves to fly.

Code work requirements

A rather awkward situation has developed at aviation radio stations with regard to the renewal of second-class and the qualifying for first-class licenses. Such stations are not open to "public correspondence," and according to regulations one year of code work at a public station is required before a second-class operator may renew his license the second time, or get a first-class rating. There was authorized in January, 1932, for the first time a radio telephone aeronautical class license valid only for the operation of aircraft and ground aeronautical radiotelephone stations. To secure this license one must pass an examination in radiotelephony and the following special subjects: Meteorology, Air Traffic and Aeronautical Laws, Airplane Dispatching, Teletype Operation, and Aids to Aerial Navigation. Commercial operators who pass an examination in these subjects

may have their licenses endorsed to permit them to operate aviation radiotelephone sets

A mechanic's license always means more money to a radio operator of any class—usually an increase of $25 per month at least. The Department of Commerce ordinarily allows the time spent working on planes by a radio operator in any capacity to count as "mechanic's experience" required in obtaining a mechanic's license. It seems plain then that the aviation radio personnel should qualify as aviation mechanics—but before that, how qualify as aviation radio personnel?

A sea-going operator will require about six weeks special training before taking over any transport company's radio job as station or plane operator. In either case he must be competent to maintain his own set and to assist in the servicing of planes. Such men when first hired are employed at a terminal or major airport to assist three people—plane mechanic, station operator and radio service-man. The radio service-man is a licensed operator known as a radio mechanic who is especially good at servicing radio equipment. His duty is to remove the radio sets from the planes, test, overhaul and re-install them. The sea-going operator, by first acting as an assistant, finally learns when and how to do this alone. He cleans the entire set and oils the generator. He tests the battery and recharges it if necessary; he tries out the receiver for noise distance, etc., on the plane and also at the airport radio station; he sets up the radio transmitter with its own power plant on a special test bench and records its exact performance.

In six weeks time a new radio man usually tears down and reassembles a dozen or more complete sets and "shoots" trouble on half a dozen more. Coincident with this radio shop work, he gasses, oils, and washes planes and also helps with any engine or airplane repairs. At certain hours he stands an auxiliary watch in the radio station, at first merely "listening in" with an extra pair of headphones, checking over the sent and received messages and watching the transmission schedule or "sequence clock." Later he handles the traffic while the regular operator listens in, coaching him and noting the handling of the set. Finally he takes over the watch. If he forgets a schedule, becomes excited, discourteous, or abuses the set he has failed to qualify. If broadcasting, pilots must like his voice. The man with a hollow tooth or a lisp doesn't stay long on the air.

Aiming at the second class

The mechanic or mechanic's school student has a longer, more leisurely schooling while qualifying as a transport radio operator. To qualify for a third-class license he must learn to send and receive accurately only fifteen words per minute, but it is better to play safe by learning to do eighteen or twenty without "breaking." About two hours a day code practice for four months is required by the average student before passing the third-class code test. Most men, however, prefer to practice code for six months and then try for second class at twenty words per minute. In case of failure they are not permitted to try again for three months but they may take the third-class examination at once.

A thorough knowledge of the electrical principles underlying arc, spark and tube radio transmitters and tube receivers must be gained to secure second class, and the study leading to third class should include these same subjects, although arc and spark sets are not required for third class. The student should prepare at the start for passing the second-class examination as this can be taken any time after receiving third class. The examination on storage batteries, generators, and radio regulations is about the same for both third and second-class licenses.

School courses

A school presenting a course to qualify its graduates as airport and airline radio personnel will require students to do a great deal of practical work on the aviation radio sets now in use. For example, the Boeing School of Aeronautics has been giving radio to a certain number of the students enrolling for what the school calls its "master mechanics course." This is a nine-month course, and as the graduates in radio usually get licenses, the training methods are of interest.

All students are required to take a certain amount of radio code and theory during the first three months. A radio course, together with certain aeronautical subjects including meteorology is then given to those students who successfully complete the first three months' course and who elect radio as a major subject, qualifying the student who graduates, for second class. It also qualifies the graduate who obtains a second-class license to take up radio communication work on several major airlines. The work of actually servicing planes already described in the case of qualifying the sea-going operator, is accomplished by the student as "field operations."

The Pan American Airways System requires that "the radio operators employed must have had professional experience in order to qualify them for our service." Such professional experience is usually gained with a regular commercial radio communication company, either at sea or at a land station. Most of the Pan American operators have had from three to five years experience before being employed. Eastern Air Transport assigns written questions to their operators from time to time as a guide to required study. New men failing to progress are dropped from the payrolls. For men employed who wish to qualify for an air radio job there are several correspondence courses available.

In every transport company there will be found someone whose duty it is to develop and check the qualifications of radio personnel. When a visual radio-beacon receiver, a radio compass and a blind landing receiver are all added to the present equipment of the transport plane, highly trained radio men will become essential units in any active operating company.

Cockpit of a modern transport with radio equipment

Although French and German interests are now engaged in developing aircraft for stratospheric flight, American engineers have long been considering the problem as evidenced by Boris V. Korvin-Kroukovsky's series of two articles published in AVIATION, April and May, 1929. The European material for the present discussion was furnished by Maj. Oliver Stewart and Rene Leonhardt.

Above the dark blue weather

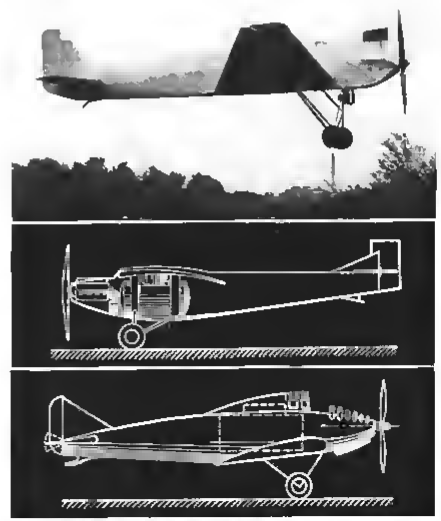
Airplanes that are to fly in the stratosphere

THE above paraphrase of Elliot White Springs' well-known title may easily become a slogan for air transport operators in the not far-distant future. Ask any operator today about his troubles and the answer is not airplane, engine, or pilot, but invariably involves the weather. Vast sums are now being spent in installing intricate systems for predicting weather conditions and disseminating weather information from point to point along the ground, and to airplanes, in the air, but as far as controlling or making planned use of the weather is concerned, Mark Twain's famous remark still applies.

It has long been predicted that if sufficiently high altitudes could be attained by aircraft, many present-day navigational problems would disappear. For convenience, the layer of atmosphere surrounding the earth has been divided into two zones, the first, extending from the surface of the earth to an altitude of some 50,000 ft. being designated as the *Troposphere* and the outer shell extending beyond this limit to the region where, as far as is known, the last molecule of air disappears into a complete vacuum is called the *Stratosphere*. So far, aerial navigation has been confined to the lower reaches of the troposphere in a region where rain, fog, and thunderstorms abound, and where the winds, passing over the irregular contours and hot or cold areas of the earth's surface, create erratic currents which are continual sources of discomfort and danger to the air traveler. Although there has been only one recorded penetration of the stratosphere by a human being, that of Professor Piccard last year, studies made by sounding balloons and other means have indicated that wind conditions are much more uniform there than in the troposphere, and it is predicted that uniform air currents will be found at various levels which may be depended upon to assist aircraft in flight. In short, a pilot in the stratosphere will probably be able to find a charted tail wind no matter in what direction he wishes to travel.

Flying far above the clouds or any overcast conditions, the problem of navigation over long routes will be very much simplified, as the stars will always be visible even in the daylight, so that astronomical bearings may be taken at any time.

Although the problem was originally considered from a purely commercial standpoint, certain military people have recently developed an acute interest in stratospheric flying. Briefly, the tactical idea behind the stratospheric plane in an air force is that it shall operate at altitudes safe from anti-aircraft fire, searchlight beams and balloon barrages. Height is the most important of all aircraft tactical advantages, for height is potential speed and potential maneuverability. An air force equipped with machines that can outclimb those of their opponents by as much as 2,000 or 3,000 ft. has a tremendous advantage. If that margin be increased to 10,000 ft. the advan-



Top: The Junkers stratosphere plane in flight. Center, Sketch of the Farman high altitude airplane showing a phantom view of the tank-like cabin enclosure and entrance manhole. Bottom: The Gorrehals transport plane designed for the stratosphere

tage becomes overwhelming. Such machines can move freely over enemy territory without danger of being attacked, and, in addition, their own striking power is immeasurably increased.

Practical difficulties

Attractive as it may be to both military men and commercial operators, stratospheric flying is not without its practical difficulties. So far the world altitude record for airplanes rests with Lieut. Apollo Soucek, U.S.N., who piloted a Wright Apache to a little over 43,000 ft. Last year, Professor Piccard and one companion after much preparation, and enduring great physical hardship in the course of their flight, succeeded in reaching 52,500 ft. in a spherical balloon thus barely penetrating the lower fringe of the stratosphere. At such altitudes the reduction in density and temperature of the air affects the operation of airplane, engine and pilot very seriously. Under normal conditions, the atmospheric pressure drops to one-half its sea level value at 18,000 ft. one-quarter at about 33,000 ft., and is only approximately one-eighth sea level pressure at 50,000 ft. At the same time, the temperature goes down from a normal year-round average of 59 deg. F. at sea level to a uniform value of about — 67 deg. F. above 36,000 ft. Since the human body requires a certain atmospheric pressure (it has been estimated that about 45,000 ft. is the critical altitude in this respect), as well as a supply of oxygen, and can function properly only within a relatively narrow temperature range, it is necessary to establish and maintain approximate sea level conditions within a closed cabin by some artificial means regardless of temperature or pressure conditions outside. This requires a very careful study of cabin insulation and of methods of maintaining an air supply at normal pressure during the course of a flight.

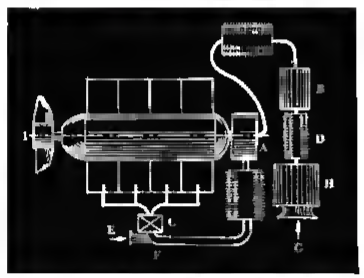


Diagram of the Farman high-altitude engine, showing the series of superchargers (A, B, and H) and intercoolers. The carburetor (C) is fed atmospheric air (at E) at low altitudes

The power plant problem is equally serious, for not only does the power output of an internal combustion engine drop off rapidly with altitude, but also propeller efficiency changes with variations in air density. A series of superchargers designed to cut in automatically as various altitudes are reached, will probably solve the problem of power output. One such engine has already been designed by the Farman Works in France—an eight-cylinder vee type developing 350 hp. and provided with a series of compressors. Up to about 13,000 ft. the carburetor is fed with atmospheric air. Between 13,000 and 25,000 ft., the first compressor (*A* in the attached diagram) is in operation. Above 25,000 ft. compressor *B* is cut in which will enable the engine to function properly up to some 34,000 ft., after which the addition of the third compressor (*H*) is expected to enable the aircraft to ascend to approximately 62,000 ft.

If full sea-level engine power could be maintained to an indefinite altitude, the effect on a typical airplane would be to increase the unsupercharged ceiling height by a little over 200 per cent. With such perfection of supercharging, ceilings of 60,000 to 80,000 ft. would be commonplace.

An interesting proposal has been made recently by Col. Italo Raffaelli in the *Rivista Aeronautica* involving the use of steam power plants for high altitude flying. Although the specific weights of steam plants are high at present, there is reason to believe that they can be brought down to a reasonable range, particularly as the size of power units are increased. Reduced pressures naturally affect steam plant operation, but it is a much simpler job mechanically to insure a sufficient supply of oxygen to a boiler than to an internal combustion engine. No compressor is required, as the increased volume of air may be obtained by a wider opening of the air intake valve.

As far as propellers are concerned, the problem is to develop a design that will absorb the full engine power under the low density conditions at high altitudes, and, at the same time, not overload the engine at sea level during take-off. Theoretically, the best solution would be a variable diameter propeller, but mechanical considerations make this method impractical. Various other expedients have been tried, including a gear changing device which was applied to a Liberty engine at Wright field to give two distinct ranges of propeller speed, but so far the only feasible method seems to be the usage of controlable pitch, although such propellers cannot be relied upon to absorb the full output of a supercharged engine over an altitude range of more than 10,000 to 15,000 ft. A number of such propellers are now on the market.

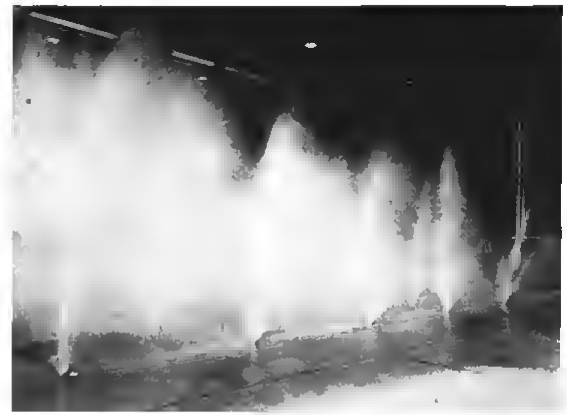
Junkers and Farman

So far Germany and France have shown the most active interest in the problem of stratospheric flying. The best known experimental types have been built by Junkers in Germany, and Farman in France. The Junkers machine resembles in general an ordinary airplane of the F-13 type, except that it has a narrower fuselage, a lighter undercarriage, and the wing area is greater. For the first experiment, the machine has been fitted with an ordinary Junkers type L-88 engine of 800 hp., but it will be fitted later with a supercharger. The cabin will accommodate two pilots and the necessary instruments, and is strong enough to withstand the difference in pressure between sea level and extremely high altitudes. Some difficulty has been encountered in securing air-tight transmission of the controls, but it is understood that the problem has been practically solved.

The Farman machine is similar to the standard Farman 190 type, but has a larger wing area, 60 square meters as against the normal 45, and it is likewise fitted with a pressure-proof cabin to accommodate pilots and instruments. The Farman engine was described in an earlier paragraph. It drives a four-bladed propeller of adjustable pitch. Another French engineer, M. Gurchais, formerly connected with the Farman Works, has designed another stratospheric airplane of somewhat different type. It is intended not only for experimental work, but for actual commercial flying at high altitudes. The machine is a monoplane of variable wing area, and is to be driven by an eighteen-cylinder Lorraine engine developing 700 hp. For high altitude flying a Brown-Boveri turbo-blower and a Ratier controlable pitch propeller are provided. With this power plant it is expected that the machine will be able to fly at altitudes of approximately 47,000 ft.

These machines mark the beginning of an effort which may easily alter the air transportation problem as we know it today. It is not impossible that in the not too-distant future long-distance passenger routes will be operating regularly between the 50,000 and 75,000- ft levels in that region where weather problems are practically non-existent.

By
Perry A. Fellows
Engineer-Manager,
Detroit City Airport



The floor sprinklers in action. Note the complete coverage rendering it impossible for a fire to travel beyond its origin. At a recent fire test only 23 seconds elapsed between the moment of lighting the test fire and the flow of water through the open sprinklers. The ceiling of the section where the test was held is 51 ft. high

Protection from fire

Special problems presented by the great exposition hangar at Detroit

THE immediate and careful attention of engineers and architects is challenged by the problem of solving the unusual risks surrounding the housing of airplanes in hangars. Tremendous losses have been suffered in this county through hangar fires; the National Fire Protection Association reporting 287 planes destroyed in the last three and one half years in this way, and losses totalling more than $2,500,000 in one year.

The exposition building—hangar at the Detroit City Airport, scene of the National Aircraft Show last month, presented a special problem in meeting the fire hazard since it was to have about 200,000 sq.ft. of practically unobstructed floor area. The city Department of Buildings and Safety Engineering had had no prior demand for building code information covering hangar construction. Therefore, when an attempt was made to fit the proposed structure to the requirements of the existing code, it was found the restrictions set up to regulate garages were about the only one which could be applied. These called for the division of the building by fire wall construction into such small units that it would be valueless in handling aircraft. It was decided to proceed with the design and erection of a building without the dividing walls but equipped with a satisfactory substitute for the control of fires. Installation of piping which would permit a curtain of water to be thrown about a fire was proposed but the efficacy of water in the control of hangar fires was at that time seriously questioned. Final selection of a satisfactory solution was deferred pending the completion of the tests conducted by the Fact-Finding Committee on Automatic Sprinkler Protection for airplane hangars at Washington in the spring of 1930.

In the meantime many unusual ideas were suggested. One proposal was that the entire hangar floor be built on a grade inclined toward the doors so that the planes, impelled by gravity, might roll from the hangar out on to the apron whenever fire operated the thermostatic control opening the doors and releasing the planes.

The main hangar at the Detroit City Airport finally was equipped with a multiple deluge system of open overhead and underfeed sprinkler heads, designed and installed by the Automatic Sprinkler Corporation of America. A feature of this system is control of operation by means of devices embodying the principle of rate of rise of temperature rather than by fusion of metal links in head. That is, the water is released when the temperature rises rapidly in a short space of time. There are 1,848 heads in the floor spaced at intervals of 10 ft. in both directions. The ceiling heads are 2,720 in number at 8-ft. intervals in both directions. Sixty-four deluge valves controlling approximately 70 heads each are operated by 256 head actuated devices of the bulb pneumatic type. There are four devices to each deluge valve. The floor sprinklers were installed to prevent a fire spreading by following unwetted surface underneath the wings, areas often protected from the effect of only overhead sprinklers.

Sheet metal curtains were built along the lines of some roof trusses, dividing the space above the lower chord into pockets. Thus heat rising from flames would be accumulated in a pocket over the fire and so cause the release of water directly over the points where it would do the most good. Without draft curtains the heat might be carried horizontally by the air currents and the temperature might build up at a more rapid rate and flood a remote part of the building where there was no fire.

Another important item in the design of the building, one which has an important effect on the efficiency of the fire protection system, is that of floor drainage. It is not uncommon in any building to find the floor drains located at points in the floor higher than the surrounding areas. This is, of course, a disadvantage under any circumstances but particular care must be taken to avoid it when floor sprinklers are used. The velocity of a stream of water issuing from the sprinkler head is reduced materially if it is necessary for that stream to penetrate a sheet of water of any considerable depth. The floor drains and pipes leading away from them should be designed with sufficient capacity to carry away the water as fast as it falls, thus reducing the possibility of the spread of fire by the flaming gasoline on the surface of these pools.

EDITORIALS

AVIATION

EDWARD P. WARNER, *Editor*

Reflections on a visit to Detroit

THE National Aircraft Show of 1932 has called forth a great amount of croaking, and a lot of dismal comparisons with the records of past years, but we decline to join in any such chorus. To us it seemed definitely the most encouraging exhibition that has been held since the beginning of 1930.

We don't for a moment suggest that we expect 1932 to be a good year. From the point of view of the manufacturer it bids fair to be, to put it frankly, terrible. 1933 may be much better, or it may be equally bad. It takes a certain measure of recklessness to venture a prophecy even twelve months in advance. To attempt more than that would be simply foothardy. But whenever the turn comes, whether in 1933 or in 1935 or some other year, the section of the industry that manufactures commercial aircraft has seen the worst part of the depression. Financially we may lose some ground yet, but psychologically we have reached the bottom and begun to look up. A large part, and the most responsible part, of the aircraft industry has completed its mental deflation. We are adjusted to the facts. It hasn't been easy, but we have done it at last.

We have come out of a spin, and gone into a steady glide under full control. The next step is to get the engine started, and turn the gliding path into a climbing one.

To put the same thing in other terms, the aircraft industry has finally matched its tempo to that of the general economic life. During the past two years we have been suffering very largely from troubles peculiarly the aftermath of a boom in a particular industry, and growing out of the over enthusiasm of 1927-29. In the spring of 1932, the immediate echoes of the boom have died away. If there is further decline in the aircraft market it will be because a world-wide depression is continuing to reduce purchasing power and the general volume of economic activity. The decline from the peak of the boom is over, and we are stabilized to the average pace of industry. The present indication is that the number of civil airplanes built in the United States this year may be from 40 to 50 per cent below the total for 1931. But we can take heart from the fact that the number of automobiles produced unless there is a spurt in the near future and notwithstanding the tremendous effort that the automobile industry has made in improving its products, seems likely to fall off by almost the same percentage. The best of the standard business indices, showing the strength of basic industries and geared to the most fundamental necessities of our economic life, are off some 30 per cent from the figures of a year ago. Two years ago the aircraft industry seemed to be a special victim. Today we are only sharers in the general misfortune, and the outlook is changing correspondingly.

As a matter of fact, to digress momentarily, one branch of the aircraft industry isn't sharing misfortune at all, but is steadily improving its position. Air transport, in practically every one of its branches and in every index of public acceptance of its services, has gained ground steadily since 1929, while every other form of transportation has been losing.

In the closing days of the national show, Detroit was spotted with patches of thick gloom over the scarcity of sales of aircraft compared with the records of previous years. It may seem more than a little odd to draw encouragement from that very fact. Yet it contained a definitely encouraging symptom. It brought evidence that the aircraft industry as a whole has finally concluded, as some of its members concluded long since, that prosperity cannot be regained by saying it is here, and that fictitious sales will not stave off creditors. Only a few sales were reported this year, but they were genuine sales of actual aircraft for real money. In past years the totals of business alleged to have been done at the show have been fabulous, but some of the individual reports on which they have been based have been nonsensical on their face, and later observations of production and delivery figures have proved that they were nonsensical.

Most hopeful sign of all was the exhibitor's list. It was, we believe, Dean Seashore of Iowa who devised a somewhat grim but highly effective method of impressing college freshmen with the fact that life was real and earnest. He assembled them all before him each year, and then said: "Let each of you turn, and look upon the man at your right. When June comes, he won't be here. Now, gaze upon the man at your left. Four years hence he won't graduate." There have been aircraft shows in the past that have given one somewhat that same impression. There was very little of it this year.

The industry has shaken down. Some of its component companies are having financial trouble, and some of them will have a lot more before they get through with the depression, but most of the exhibitors of airplanes and engines at Detroit represent such an accumulation of experience and such a body of customer good-will that we entertain full confidence of a permanent continuance of their activity in some form. At times in the past we have been very frank in stating our conviction that there were too many airplane companies, and that forced eliminations were inevitable. The process of forced elimination hasn't yet definitely reached its end, but the end is definitely in sight.

There was a time when aviation was habitually referred to by those interested in it as a "game." It was succeeded by a period in which aviation, like radio in one phase of its boom, threatened to become a cross-section through chaos. Today we have a sound industrial footing upon which to build. The industry still has a narrow and winding path to traverse, but at least it is a path, and that in itself is an improvement. For some time past we had been walking a tightrope.

A new idea for the air mail

AIR transport's greatest need of the hour is that the air mail be strengthened. Rapid as is the growth of passenger travel, more than two-thirds of the revenue of the American transport lines still comes to them through the Post Office. The future prospect of air transportation depends upon further expansion and improvement of air mail service, combined with steady progress towards elimination of the deficit. No expedient that will make it possible to increase the amount of traffic handled, and to put the increase upon a basis profitable to the Post Office Department, can be overlooked.

The matter is particularly urgent at the moment, when literal disaster is threatened by an impending rise in postage rates. The tax bill now before the Senate projects an increase of first-class postage to 3 cents. It has been intimated in Wasbington that the natural consequence of such an increase would be a proportionate raise in the air mail rate, probably to 7 or 8 cents,—an action within the administrative discretion of the Postmaster General. Under present conditions, with every business pinching pennies to the utmost, an increase to 8 cents would reduce the traffic by at least 20 per cent, and perhaps by a third or more. The airlines will be the sufferers, for reduced loads will shift them into lower brackets of the compensation schedules in many cases.

In this critical hour there comes a scheme. It is not a panacea. We are sceptical of panaceas. It will not make the air mail self-supporting over night, nor put an end to all the troubles of the operators, but we believe that it is a good scheme and one that deserves every possible encouragement.

The new idea is the work of Mr. A. L. Rushton of Omaha, whose previous connections with aviation are limited to the private ownership of a plane and to the indefatigable patronage of the air mail service with all his own business correspondence. As Mr. Stout pointed out in AVIATION last month, really good ideas come with astonishing frequency from outside the ranks of the profession or industry most directly concerned. A New England school teacher who had never seen a field of growing cotton invented the cotton gin. An artist invented the electric telegraph. Mr. Rushton, merchant of dairy products, has become the sponsor of a new form of air mail.

Mr. Rushton has presented the plan himself on page 242 of this magazine. In summary, it consists of reducing the rate for carrying by air a sheet of letter paper, gummed and perforated along the edges so that it can be folded over and sealed to serve as its own envelope in the manner familiar to every American visitor to continental Europe, where such stationery is common. Such a letter-envelope, with inclosures prohibited, would weigh about one-sixth of an ounce. At 3 cents postage it would actually be more profitable to the Post Office Department than ordinary letters, miscellaneous in size, shape, and weight, at 7 cents an ounce. The higher rates would of course continue for ordinary air mail.

We say again that we don't consider this as a cure-all, but we do think that it would be of great assistance, both to the Post Office's income record and to the transport lines. The benefit might amount to $100,000, or it might amount to $2,000,000. Neither sum is to be sneezed at. There may be something fundamentally wrong with the plan, but you will have to show us. Many objections have been offered to it in the course of Mr. Rushton's correspondence with interested parties all over the country, but most of them strike us as either exceedingly silly or quite easy to overcome.

On the present air mail rate schedule the sender of an ordinary business letter has to pay for more weight than the airplane really carries on his behalf. The minimum rate is on a one-ounce basis, because the American people have the habit of thinking of postage rates that way and won't be bothered to weigh their mail. Actually, an ordinary business letter of one page of bond paper weighs with its envelope 0.42 ounce. A two-page letter, 0.59 ounce. In European countries it is the almost invariable rule that the minimum air mail rate is for a communication weighing approximately one-half ounce. Here, that has been considered too much trouble. Mr. Rushton has provided a way out of the dilemma by offering a standard piece of mail that need never be weighed by the sender, that will be exceptionally easy to handle because uniform in form and weight, and that will always be light enough

to justify a substantial reduction below the regular one-ounce air mail postage.

But quite aside from the merit of the letter-envelope for general business use, it has a special virtue that no other form of air mail possesses in competing with the night letter. Etiquette demands that business letters shall take a special form. They must be typed, with proper superscription and subscription, and errors made in typing must be corrected upon the machine. In most offices dictation has to be finished well before the end of the day to get the letter off that same night, but a night letter can be scribbled with a stubby pencil, handed across the counter to a clerk, and despatched upon the spot. The air mail letter-envelope, distinctive in form, has the virtue of informality of appearance, and lends itself admirably to the sending of long-hand memoranda.

So far as the profit of the Post Office Department from the use of the light-weight, low-rate, standardized, air mail mailing piece is concerned, Mr. Rushton seems to have fully proved his case in his letter on page 242. The profit to the air transport operators would be less immediate and less direct, but none the less real. We suggest that everyone who has any interest in air transport, and that means every reader of AVIATION, should make it his or her business to read Mr. Rushton's letter and this editorial and to think about them carefully. If your thought leads you to conclusions as favorable as our own, make it your business and that of your friends to press it upon the attention of your Congressman. Tell him that something ought to be done about it,—not as another method of spending money, but as a definite contribution to the improvement of the federal government's budgetary position in the next year. Make your views known, promptly and vigorously, and it will yet be possible to get action at the present session of Congress.

Maintenance costs and profits

THE phrase "turning the corner" has been so monotonously reiterated by economic soothsayers during the past eighteen months that its use is very likely to start a severe epidemic of the jitters. It must be risked here, however, for transport aviation has come to a corner which must be turned without delay, if it is to survive on a sound economic footing.

From an economic standpoint, aviation has passed through three distinct periods, and now stands on the threshold of a fourth. From 1905 to 1914, the designers' problem was largely one of invention: to produce something that would get off the ground in any fashion. The war years necessitated a different philosophy. Performance was paramount,—for the control of the air rested with the machines which could fly highest and fastest. The third phase developed in the decade ending with 1930, when business and high finance became aware of the possibilities of aircraft in the transportation field and set up a program designed primarily to develop "air-consciousness" in the average citizen. These three periods, although differing widely in point of view, had one highly important element in common. Essentially, money was no object. In turn, the wealthy sportsmen of 1910, the war-driven governments of 1918, and the air-minded investors of 1927, poured out their dollars without stint, with their eyes fixed with fanatic zeal on distant future horizons.

The financial crisis of 1929 and '30 merely accelerated the inevitable. Manufacturers and operators alike had to face the fact that they must stand on their own feet or pass out of the picture entirely. As pointed out recently by Capt. Frank Courtney, aviation must offer more to the public than mere flying. From the operator's standpoint, not only must safe, rapid and regular transport be offered, but it must also be possible to conduct operations at a profit. Now that the first burst of enthusiasm for *flying per se* has evaporated, few people will pay much of a premium for the privilege of swift and comfortable travel by air. The economic pressure from competing forms of transportation has become too great. With revenues thus mixed by outside influences, operators are brought face to face with the problem of reducing operating costs to the lowest possible level consistent with safety.

The key to the situation may lie in more careful study of the economies of equipment maintenance. Airlines today are spending from 40 to 50 per cent of their total outlay simply to keep their equipment in shape to fly. Maintenance costs must be cut in half to give airline operators a reasonable chance for profit. The problem cannot be solved satisfactorily within the maintenance organization, but must be traced back to its source,—the designer's drawing board. Heretofore performance has been everything, and relatively little attention has been paid to questions of ease of upkeep. Not only must new materials of longer life be developed, but the arrangement of the parts and accessories of the airplane must be carefully studied from the point of view of the man who must keep them in shape.

Means must be found to reconcile the ideas of designer and maintenance man, for it is unfortunately true that many times they are in direct conflict. In the January and February issues of AVIATION there appeared two articles by an operating man with an unsurpassed experience in the maintenance field, calling attention of designers to some of the difficulties which are encountered in his everyday work and propounding definite suggestions for improving the situation. We want more material of this sort, so that these pages may become a common meeting ground where the men who make and those who use flying equipment may discuss their problems for their mutual benefit, and so that our readers may never have a chance to overlook for a moment the importance of the subject.

NEWS OF THE MONTH

Mr. Cord capitulates

THE merger of Cord and American Airways interests featured recent air transport developments. While the full significance of this transaction has not become evident yet, the tangible results include the cancellation of all Century Air Lines and Century Pacific operations except the Los Angeles-San Francisco service, the election of Mr. Cord to the board of directors of American Airways with the understanding that he will inaugurate no independent services during a two-year term, and the acquisition of 25 Stinson transports and two Stinson Juniors for American Airways services.

The transaction wiped out Mr. Cord's offers to carry mail at 50 per cent under prevailing rates, an offer which caused much interest in Washington and much annoyance in the ranks of the present contractors. It eliminated also a competition which had been exceedingly distasteful to American Airways and Transamerican Airlines. It automatically ended the Century salary dispute, there now being no jobs for the pilots to go back to. It marked the close of a period of general unrest in air transport circles. Only two routes retain highly competitive services throughout their lengths. They follow the Atlantic and Pacific coasts,—from New York to Washington and from Los Angeles to San Francisco.

No cash was exchanged in the deal. Mr. Cord received almost 140,000 shares of the 183,683 still held by the Aviation Corporation treasury, making the total shares issued by the company 2,971,401. Previous to the public announcement of the transaction LaMotte T. Cohu, newly elected president of the Aviation Corporation, was elected president of American Airways, replacing F. G. Coburn who had resigned. Edward V. Rickenbacker, formerly sales manager of the General Aviation Corporation, and Silliman Evans, lately in charge of public relations for Aviation Corporation, became vice-presidents. American Airways suffered a serious crash March 19, when a plane westbound to Los Angeles from Phoenix crashed near Calmesa, Cal., while attempting a landing in bad weather. It burned with the loss of seven persons, all on board.

Failure had attended the application of Century Pacific Lines for a certificate of convenience and necessity to operate within the state of Arizona. The Arizona Corporation Commission, to which application was made, asked for statistical reports of passenger traffic on its interstate line stopping in Arizona and on its operations between Yuma and Phoenix, already permitted by the Commission. No statistics were forthcoming. Since Century Pacific failed to produce the required proof of public need for the new service, along a route over which American Airways fly mail, passengers, and express under certificate issued by the Commission some time ago, Commissioner Howe denied its application. The Illinois Commerce Commission last January was much more lenient toward Century Lines. The Chicago-East St. Louis route authorized at that time is being operated by American Airways, new owner of Century properties, until other arrangements can be made.

Pan American goes North

Pan American Airways and Transamerican Airlines have arranged for joint research in connection with the exploitation of a trans-Atlantic service by way of the sub-Arctic. Just before this announcement Transamerican secured an exclusive American landing right in Iceland, reported later to have been retracted by the Danish government. Pan American in the meantime secured rights to establish a flying boat base on Castle Island in Boston harbor for the Boston-Halifax run.

Again Pan American has strengthened its position in the West Indies, this time by acquiring the Compania Nacional Cubana de Aviation Curtiss, a company which has been operating passenger and Cuban mail services on the island for almost two years and which has enjoyed liberal support by the government. Pan American reports about 500 passengers on its all-expense tours to Havana, Nassau and other points in the West Indies this season. Air transport systems were included in the recent suggestion by Chairman Claude R. Porter of the Interstate Commerce Commission that all forms of transportation be united in a huge coordinated system to meet the adverse economic conditions which carriers are facing, and that all should be subject to regulation on the same terms.

A number of airlines have announced operations changes. United is adding another run between New York and Chicago, giving four daily flights over the route with Fords. The new plane leaves Newark at 5 p.m. and makes connections at Chicago to provide a second 28-hour service between New York and San Francisco. The company also added another run with Fords between Los Angeles and San Francisco one between Seattle and Portland, one between Chicago and Dallas. Varney now operates four round trips daily between San Francisco and Los Angeles, with Orions. Nick B. Mamer has reopened his Seattle-Spokane service; Marts Airlines has resumed operations between Newark and Buffalo by way of Scranton and Elmira. Eastern Air Transport has reduced its three trips per day between Norfolk and Richmond to one per day. Hanfords Tri-State Air Lines is operating between Sioux City and the Twin Cities. Postal Telegraph now is handling for United the ticket service formerly provided by Western Union.

Calendar

May 27-30	National Balloon Races and Second Annual Omaha Air Races, Omaha
June 9-10	Pacific Coast Aeronautical Meeting of the A.S.M.E., Berkeley, Cal.
June 17-19	International Air Pageant, formal opening of Aviation Country Club of Lake Champlain, Westport, N. Y.
June 25	13th Annual Royal Air Force Display, Hendon England.
July 8-9	Sling's Cup Race, Brooklands Aerodrome, England
July 18-31	Third American Soaring Meet
July 22-31	Third International Aeronautical Meeting, auspices Aero Club of Switzerland, Zurich.
July 28	Pre-Olympic Air Show, San Diego
Aug. 1-6	International Soaring Contest, Wasserkuppe, Germany
Aug. 11-26	International Air Tour, auspices Aero Club of Germany
Aug. 19-21	Fourth Annual Canadian Air Pageant, St. Hubert, Quebec.
Aug. 27-Sept. 5	National Air Races, Cleveland
Sept. 6	Aviation Day, National Travel Pageant, Atlantic City, N. J.
Sept. 25 or Oct. 6	Gordon Bennett Balloon Race, Beale Switzerland.
Oct. 8-23	Aviation Exhibit, 46th Annual State Fair of Texas, Dallas.
November	Thirteenth Aeronautical Exhibition, Grand Palais, Paris.

The dark continent in the limelight

Only seven months after he had made the fastest flight from Australia to England young James A. Mollison chalked up a similar record across an-

other continent. Avoiding the bright lights of Cape Town's Windermere Aerodrome he came down in the darkness of Milnerton Beach on the other side of the South African city, four days, seventeen and a half hours after taking off from Lympne Aerodrome in Kent, England. His Gipsy-powered Puss Moth monoplane, which crashed in the soft sand on landing, covered the 6,250 miles across the Sahara and down the west coast in fifteen hours less time than a similar plane flown by Peggy Salaman and Gordon Store last November, and little more than half the time of R. F. Casparenthus the fastest solo flyer to precede him. Two special tanks carrying 120 gallons of fuel, sufficient for 22 hours of flight were the plane's only extraordinary equipment. Because of strong seasonal southerly winds the Royal Air Force non-stop record attempt, planned to follow the same course, was postponed until next November.

In the air at the same time were Lucien Boussotrot and Emil Rossi, on the way to regain the world's closed circuit distance record established by them more than a year ago but broken by Le Brix and Dorset in a 6,265-mile flight last July. Flying a triangular course over Oran, Algeria their Bleriot-Zapata monoplane, powered with a 600-hp. Hispano-Suiza engine, covered 6,600 miles without refueling despite the unexpected loss of 135 gal. of gasoline during the flight. It was in the air 76 hours 35 minutes seven hours less than the Packard-Bellanca record of last year. The same distance in a straightline between New York and Lake Aral, Siberia is a flight which the two French fliers plan to attempt this summer to break the airline distance record now held by Boardman and Polando.

Aircraft on display

En route from St. Louis to the Detroit Aircraft Show, Maj. James Doolittle set another inter-city record. The Laird racer in which he won the Bendix trophy transcontinental race last fall made the 452 miles between the two cities at an average speed of 240 m.p.h.

Under joint auspices of the Aeronautical Chamber of Commerce, the airlines and the Hearst Enterprises, a contest was held in ten cities preceding the National Aircraft Show among school children for free trips to the show, the winners being the individuals in each city who turned in the best answers to a series of questions on air transportation run by the local Hearst paper each day for two weeks. About 3 000 complete answers were received, and there were many times that amount only partly filled out. They were judged by local committees appointed by the Chamber and local airline and Hearst representatives. The contest

Wide World

THE AIR CORPS PARADES

Planes of the First Pursuit Group from Selfridge Field parked with precision on the apron in front of the Detroit City Airport Hangar during a session of the National Aircraft Show which was held in the big hangar.

created a great deal of interest and resulted in some excellent airline publicity. The winners were entertained during their four days at Detroit by visits to automobile plants and points of interest beside the show.

Among recent rate cuts are those of the Boeing School of Aeronautics. Fees now range from $355 for a private pilot's training to $5,200 to become a master pilot, involving 924 hours at ground school and 250 hours flying.

At the International Aero Exhibition taking place during April at the Zappion Palace in Athens, Greece, the concentration is on scale models rather than full size planes. Exhibits of 22 British manufacturers show the development of the industry from the first flimsy machines to the military and civil airplanes of current production.

Plans for the summer's schedule of aeronautical events begin to materialize. The Second Omaha Air Races, under the management of Philip Henderson, have a three-day program of races, exhibitions and acrobatics to which women pilots will be admitted for the first time. As finale the annual National Balloon Race is scheduled, in which two Goodyear balloons have been entered in addition to the usual team of Army balloons.

Club competitions, here and there

The International Rehability Tour, taking place between Aug. 11 and 28 this year under the auspices of the Aero-Club von Deutschland, is to be limited to two groups of light sport planes having specified safety and technical qualifications. Each pilot must have complete liability insurance, effective in all the countries flown over. Ten days after the technical tests the tour proper starts from Tempelhof airport at Berlin. Three stages totalling 4 568 miles, with 26 compulsory landings, among them Warsaw, Prague, Vienna, Rome, Paris, Copenhagen, and Gothenburg must be covered in six days. Money prizes reward the winner in addition to the silver cup to his club which must organize the next competition.

An exclusive contest in cross-country navigation, organized by a London newspaper, will be held in Great Britain, which has not entered the international competition. Pilots, who must be British and fly British commercial planes, will start from Heston Aerodrome with sealed orders to be followed by map and compass.

Membership in the 38 registered British flying clubs increased by nearly 400, to about 11,700 during the past year. In the 22 clubs subsidized by the government the membership was 6,711 persons, of whom 380 qualified for private licenses. Government allowance to clubs for each license obtained by a member, about $50 in the past, will be increased under the new budget, the maximum sum payable to any one club reduced. Since no club recently has come within $1,000 of the limiting figure no hardship is anticipated. The 28 planes owned by subsidized clubs made 71,474 flights during 1931, checking up a total of 28,686 flying hours for their members.

The Thied Annual Sportsman Pilots Race of the Aero Club of Pennsylvania, is among the few events reserved for amateur pilots in the U. S. this year. Handicaps for the race which will start and finish at Patco Flying Field near Philadelphia on May 29, are to be determined in actual speed trials over a three mile course by J. Wesley Smith, racing pilot of the club. Victory, dependent more on navigation and technique than on speed, is rewarded with the Hobinshead N. Taylor Memorial Trophy.

Rules to define amateur air pilot ranking, an outline for an amateur air pilot precision pentathlon to select the outstanding man and woman pilot in the United States and plans for a President's Cup Race similar to the King's Cup Race held annually in Great Britain are the result of recent cogitation by the U. S. Amateur Air Pilots Association. If President Hoover agrees to donate the cup it will be awarded during the National Air Races at the end of a handicap race from Washington to Cleveland. Also like the Kings Cup race, it will be a test of skill in cross-country flying and navigation.

Packard diesel crowned

Most recent addition to the list of outstanding aeronautical achievements awarded the Collier Trophy, donated by the late Robert J. Collier, is the Packard diesel engine. Developed by the Packard Motor Car Company under the direction of the late Capt. Lionel M. Woolson, who was given special mention in the award, the diesel engine demonstrated its value by the establishment of the world's non-refueling duration record in May, 1931.

First successful radial-type diesel engine to be built, it was first announced for commercial production in 1930 and recently adapted to use in lighter than-air ships. Two diesel engines power the Goodyear non-rigid airship "Defender." The Trophy, presented by President Hoover on behalf of the National Aeronautical Association on March 31, was first awarded in 1911 to Glenn H. Curtiss for his development of the hydro-aeroplane, later to Orville Wright and in 1930 went to Harold F. Pitcairn and his associates for their work with the autogiro.

While Juan de la Cierva, inventor of the autogiro, celebrated Easter in Spain, the object of this most recent research was discovered in a shed at Hamble Air Club (England). Spectacular news releases, the only sources of information, describe a plane with no fixed wings, but having the usual properties of the autogiro. The European press predicts for it the speed of Schneider Trophy planes. The Autogiro Company of America called the wingless plane part of an experimental program and doubted that its performance would exceed that of the conventional autogiro.

Preparatory to commercial production of its new model and a national campaign on the private owner market the Kellett Autogiro Corporation is offering to the public for the first time a block of preferred stock. Through the Wallace Securities Corporation, formed for the express purpose of handling this financing, an issue of 150,000 shares of Class A stock is being sold at five dollars a share.

Profits and losses

Contrary to general practice, Pan American Airways Corporation during 1931 operated at a profit for the first time in its history. After depreciation, taxes, amortization and all charges net income was $105,452, or 21 cents on each of 502,380 shares of common stock outstanding, as compared with a net loss of $305,271 in 1930. Gross income from operations increased from $5,609,938 in 1930 to $7,913,587 in the year just past.

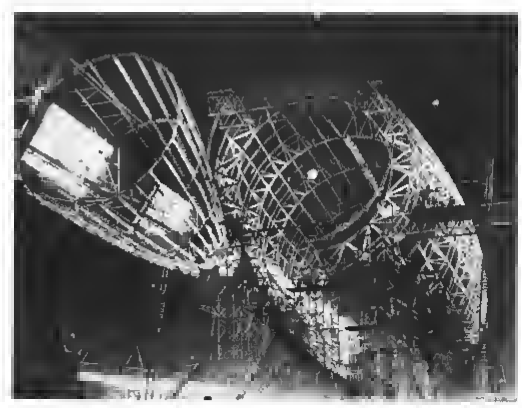
Stinson Aircraft Corporation, whose airliners fly the routes of the Ludington Line and late Century Air Lines, also shows profit for 1931 of $76,934 after depreciation, federal taxes and other charges. Equal to 62 cents a share on 124,144 capital shares this is 45 cents more than each share earned in the previous year.

A loss after all charges of $1,183,006 for the year ending Dec. 31, 1931 is reported by the Aviation Corporation of which American Airways is the operating subsidiary. Additional losses on sales of securities of $2,022,663 bring the net loss to $3,205,669. However, $4,718,080 was the company's net loss during 1930, when sales of securities brought a profit of $14,479.

Most manufacturers found 1931 unprofitable, but often more kindly than 1930. Warner Aircraft Corporation, maker of engines, lost $93,118 after charges and expenses as compared with a deficit of $129,194 in 1930. Two airplane manufacturers, Consolidated Aircraft Corporation and Waco Aircraft Company took losses of $177,449 and $82,394 respectively after charges and taxes during 1931. Waco losses were $106 550 in 1930, but Consolidated earned $127,091, or 22 cents on each 579,000 no-par common shares during that previous year. A subsidiary of Allied Motor Industries, Inc., the Great Lakes Aircraft Corporation showed a net loss of $267,413 after charges as against a deficit of $1,258,833 in 1930.

Curtiss-Wright Corporation made a similar report. Losses of the manufacturing subsidiaries for 1931 were $4,126,060 after depreciation, interest development expenses, inventory adjustments, and a deduction of $120,063, the portion of loss applicable to minority interest. At the end of the previous year these subsidiaries suffered a net loss of $9,012,919. Directors recommended a reduction of the class A and common stock to a par value of $1 a share to provide a capital surplus to absorb the write-down of property values of about twenty million dollars and operating losses. This represents a reduction in capital from $40,887,864 to $7,462,122.

Frozen assets in place of liquid cash led to the suspension of payments to creditors of the widely-known Junkers interests, airplane plant, engine factory, heater, motor, administrative and research sections, at Dessau, Germany, late in March. The Junkers-Diesel Motor Company of Chemnitz, owned



Wide World

THE MACON TAKES SHAPE

With six main frames and the corresponding intermediate frames in place, the fin section is about to be attached. Work on the airship has progressed rapidly as a result of production experience gained with the building of the Akron

almost entirely by Professor Junkers, was not involved Immediate cause of the postponement of obligations was the failure of Bossig Machine Company, of which Junkers Aircraft was creditor to the extent of $200,000 Junkers assets then dropped to slightly below the German legal requirement of twice the liabilities, making adjustments necessary. While orders from Scandinavian countries, Argentina and the Far East keep the aircraft factory running at nearly full capacity (almost a third of the world's airlines use Junkers planes) negotiations for help are being carried on with the Federal Traffic Ministry, which has come to Junkers' rescue in previous difficulties

Manufacturers speed things up

Pratt & Whitney has taken two steps up Power output in all their engines has been increased, extending the range of available horsepower from 300 in the Wasp Junior to 650 hp in the most powerful Hornet Arrangements permitting the free use of Townend rings with Pratt & Whitney engines make further contribution to speed and performance possible without fear of legal action. Licenses are granted under United States and foreign patents owned by Boulton & Paul, Ltd., the fee varying with the model of the engine for which the ring is intended

Scintilla Magneto Company has extended its scope to include a new development of Delco Aviation Ignition, resulting from engineering research made by four corporations in this field

Boulton & Paul will build, under contract with the British Air Ministry, a high speed mail plane. A biplane similar to the Sidestrand twin-engined bombers, it is to be Jupiter-powered, and equipped to pick up mail bags while in flight. It constitutes a radical departure from the British practice of combining mail with passenger transport.

After a year of preparation Stanavo Specification Board has released a chart of fuel recommendations for aviation engines, including octane number specifications. The first attempt to fit the fuel to the engine, it has been checked by engine manufacturers and government laboratories.

Repercussions of the "Buy British" campaign have come to the deHavilland company from Brazil and Sweden in orders for twelve Moth training planes for the Brazilian Navy and four more for the use of the Swedish government The newest addition to the Moth tribe is the Gipsy-powered Fox bearing a strong family resemblance to the military Tiger and also to the D H.50 of 1925. It has open cockpit for the pilot, while three passengers travel in a cabin forward. Initial costs and operating expenses of the air limousine are advertised to compare favorably with its prototype of the road, with a fuel consumption of about 13 miles per gal. at a cruising speed of 95 m.p.h

In its own dockyards the Danish Department of Marine will build its own bombers, under license from the British Hawker company Similar to the Horsley biplane used by three squadrons of the Royal Air Force, the Danish bombers will replace the water-cooled engine of the British model by an Armstrong Siddeley 800 hp Leopard, most powerful air-cooled engine made

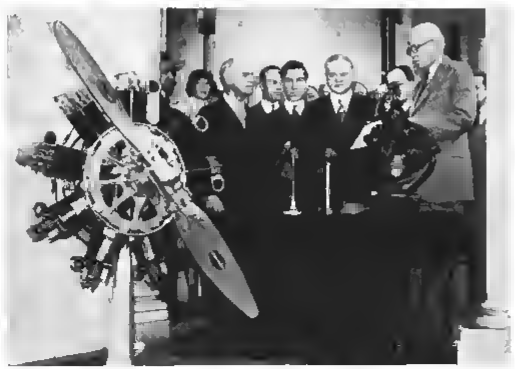
Parliaments tighten the purse strings

British Air Estimates for 1932, submitted by the Secretary of State for Air to a Parliament which accepted them with brevity and dispatch, cut almost $7,300,000 (at par) from the expenditures of the past year. Actual air allowance will be about $84,500,000 instead of $88,000,000, the additional 3,900,000 being deducted from the Fleet Air Arm grant and other appropriations in aid.

While Royal Air Force expenditures are cut to the bone civil aviation enjoys a slight increase. The air transport grant of $2,675,000 (still computing at the par rate of sterling) for the coming year includes an additional $100,000, which will go to Imperial Airways along with another $48,600 saved from the flying club accounts Payrolls of the R.A.F. and pensions likewise receive slightly more than their usual portion in the 1932 purse

With the beginning of the new Canadian fiscal year on April 1, 80 officers and 300 men, over half the normal strength of the Royal Canadian Air Force, had to be discharged as a result of a cut of more than two-thirds the previous budget for aviation. The appropriation of $1,750,000 (it was $5,442,000 last year) permits no orders for new planes and necessitates economies to the tune of $1,075,000 by the Post Office Air Mail services, forcing the suspension of most of the mail and delivery services upon which the population especially of the northern territories had come to depend The Mackenzie River Air Mail from Edmonton to Aklavik is the sole survivor among government-supported transport services.

Little can be heard of comment on the French Air Budget above the hue and cry provoked by the creation of a Ministry of National Defense to combine the venerable ministries of war and navy and the three-year-old ministry of air. Aeronautical interests fear the loss of the painstakingly developed individuality of military aviation, its treatment as merely an arm of the older services; fear a disastrous scattering of the affairs of civil, industrial and experimental aviation between the Department of National Defense and the Department of Public Works; suspect a lack of definite responsibility among the numerous sub-secretaries for the execution of the interests of both civil and military aviation. Assertions of M. Pietri, over-burdened Minister of National Defense, that the Ministry would retain complete control of industrial and experimental aviation, and his introduction into the Chamber of a law defining and perpetuating the unity of French aviation, did not entirely silence the uproar. The merging of civil and military aviation, generally regarded



Wide World

COLLIER TROPHY GOES TO PACKARD

The aneroi award of the Collier Trophy goes for 1931 to the Packard Motor Company for its development of the diesel engine, one of which powered the Beliaca on the recording breaking non-refueling endurance flight of 84 hours and 32 minutes at Daytona Beach, May 25-28, 1931

with much suspicion in the United States, appears to have attained great popularity with the French aeronautical community.

In an ancient Farman from which wings and landing gear had been removed by the police in an effort to prevent the experiment, Albert Sauvant had himself pushed over a 150-ft. cliff near Grasse in the French Riviera. His invention, a double steel-plate box equipped with shock absorbers, fitted about the pilot's seat and hermetically sealed, enabled him to survive the crash of his plane entirely unharmed.

As a result of consultations following the reciprocal air navigation arrangement between the United States and Italy last fall, touring flights may be made by American aircraft over Italian territory without special authority. Beyond the initial landing at a Customs airport and observance of forbidden zones, compulsory routes and the rules of the International Convention for the Regulation of Aerial Navigation, no special requirements are made except that to carry arms or cameras authorization must be obtained through the American Embassy.

Recent court decisions

The material immediately following, together with reference to legal and legislative matters elsewhere in the news pages, is based largely upon the Aviation Law Service prepared by the Commerce Clearing House, Inc. AVIATION is licensed to make use of the service, and is able to give its readers the benefit of the work of an organization specially trained and equipped to insure the complete collection of pertinent material on current legal developments.

Immunity from a South Carolina gasoline tax, sought on the grounds that the gasoline purchased was used only in interstate commerce, was denied the Eastern Air Transport Company a second time by the U. S Supreme Court on March 14. An unsuccessful suit to restrain the collection of the 6-cent tax which cost the airline about $5,000 a year, brought in the South Carolina District Court, had been appealed to the higher court. (Discussed in AVIATION, Nov. 31). Chief Justice Hughes handed down the opinion of the court that a non-discriminatory tax on supplies used in an interstate business is valid, and as legitimately applied to the sale of gasoline for use in an interstate airplane as to the sale of coal for the locomotives of an interstate railroad.

Another atom of precedent was added to the growing body of aeronautical law in the decision handed down by the Massachusetts Supreme Court in March 14 in the case of one Walter Wilson v. Colonial Air Transport. Appealing the decision of the Appellate Division of the Municipal Court of the City of Boston, Mr Wilson brought suit to recover personal property lost in an accident on June 5, 1929. The tri-engined plane in which he was a passenger made a nose-dive into the water when an engine went dead shortly after leaving the airport. Since sufficient evidence of negligence in the management or operation of the plane could not be produced, recovery of damages was denied.

Graf's summer schedule

Veteran of three trips to Brazil with mail and passengers in the fall of 1931, the Graf Zeppelin during the 1932 season is scheduled for ten such round trips as a regular trans-Atlantic air mail service bringing the South American mail into seven days for the round trip. The first two trips were accomplished without incident, except for slight damage to the hull which delayed the second take off from Friedrichshafen An additional feature of the current program is the pick-up of French mail from Aeropostale at Dakar, on the west coast of Africa.

Rumors of the sale of the navy dirigible Los Angeles into commercial service have been silenced by the decision of the House Committee on Naval Affairs not to hold hearings on the bill necessary to authorize such a transaction The sale of the Los Angeles had been recommended to secure additional funds to increase the size of the Macon, now under construction at Akron, by another 1,000,000 cu.ft., thus increasing its efficiency as a military weapon

Completely recovered from its recent accident at Lakehurst, the U.S.S. Akron leaves shortly on its postponed trip to the west coast for operations with the fleet in the Pacific, after which a visit to Honolulu is tentatively scheduled Lieut.-Comdr Rosendahl will be in command of the airship, in accordance with original plans for the western flight, before boarding the U.S.S. West Virginia for sea service

Air Corps saves money

The need for economy will prevent the usual concentration of Army Air Corps fighting squadrons for training and maneuvers this spring Routine training at home stations and minor joint tactical exercises will take the place of the operations in which some 700 combat, training and utility planes took part last May. Mather Field, California, home of sundry bombing activities, is to be closed down as another contribution to the budget balancing maneuvers.

Miscellaneous flying operations conducted by the Army Air Corps have broken records and saved money An aerial photograph made 23,000 ft. above Salinas, Cal., by Capt. A. W. Stevens, set a new photographic distance record showing the profile of Mt Shasta, 331.2 miles away and invisible to the naked eye when the exposure was made. Two months of successful delivery service has earned permanent recognition for an air freight line carrying supplies from the Army Air Depot at Middletown, Pa which organized the service to Bolling Field, near Washington, Langley Field, Va and Mitchel Field, Long Island The single-engined Army Fokker transport carried 28,496 lb during February, saving the depot $1,543 in shipping charges and made three emergency flights with engine replacements for stranded planes.

Personnel

Ralph S. Damon, long identified with the commercial manufacturing divisions of the Curtiss company, vice-president in charge of production of the Keystone Aircraft Corporation, and chairman of the Manufacturers' Division of the

LATE in March Frank M. McKee, Director of the Bureau of Aeronautics of Ohio, died of heart trouble. Most active in the organization of the National Association of State Aviation officials, he had been elected its first president.

AFTER seventeen years of flying without serious accident, Capt. Harry Wright Rogars was killed in a crash into Bowery Bay, off Glenn Curtiss Airport, at North Beach. Failure of the engine due to a clogged gasoline line caused the accident, which occurred shortly after the take off. Captain Rogers, who had learned to fly in 1915 and served as instructor in the Naval Air Service during the war, was a pioneer in air transport. Using flying boats of his own design, he operated an air service between Miami and New York and the first airline to connect the United States with foreign territory. He participated in the first surveys by Pan-American Airways for its service in the West Indies, and remained for some time with that company in charge of its Miami-Nassau division Since 1930, he had been manager of the North Beach airport.

MATTHEW BACON SELLERS, early aircraft designer and student of aerodynamics, died on April 5 Technical Assistant to Secretary of the Navy Josephus Daniels during the war, Mr. Sellers had also served as member of the Aerodynamic Laboratory Committee in 1912 and of the Naval Consulting Board since 1915. Designer of large and somewhat complicated machines in the very early days his more recent researches were with light planes and wind tunnels

Aeronautical Chamber of Commerce, has been elected president of the Curtiss-Wright Airplane Company. He succeeds Walter Beech, whose resignation was announced in the April issue of AVIATION.

Several changes have been made in the personnel of Stearman Aircraft Company. J. Earl Schaefer succeeds W. P. Innes, Jr., as general manager. H. F. Brown, president of the Wichita section of the S. A. E., will be factory superintendent. Mac Short continues as chief engineer. The Stearman factory will henceforth handle all servicing work for Stearman Northrop and Hamilton planes.

Frank Burr, director of the Automotive Division of the Cleveland Pneumatic Tool Company, has been put in charge of the Aeronautic Division as well.

Maj. Howard C. Davidson, commanding officer of Bolling Field, and Lieut. Louis M. Merrick, its operations officer, have been ordered to the Air Corps Tactical School at Maxwell Field, Ala. They will be among the 30 officers, including Capt. Lowell H. Smith, leader of the Army's round-the-world flight, and Lieut. John D. Corkille, test pilot at Wright Field and one-time Pulitzer racer, to attend the summer course. Lieut. Col. Barton K. Yount, now commanding officer of Rockwell Field, Cal., succeeds Major Davidson.

Roland Palmedo, governor of the Aviation Country Club of Long Island and a director and member of the executive committee of the Aviation Corporation, will represent its interests on the board of directors of the Western Air Express Corporation, of which it is the largest stockholder.

To the board of directors of Bendix Aviation Company has been elected Victor W. Kliesrath, president of the Bragg Kliesrath Corporation and one-time flying service operator.

United Air Lines, after reorganization of its western divisions, has appointed R. W. Ireland, formerly Eastern Division Traffic Manager, District Traffic Manager at Chicago to replace Thomas W. Wolfe, who has been transferred to Kansas City.

Daniel Rochford, formerly director of public relations for the Pan-American Airways, is now managing editor of *The Sportsman*, in Boston.

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Aviation before Congress

A record of bills of regulation, appropriation, stimulation, and investigation of the current session

The bill	Number	Its history
To initiate a new Maritime Code of the air for aircraft plying in international trade following the line of steamship legislation (McNary Bill)	S. 717	Virtually identical bills would provide liberal mail contracts, limited liability and legal status for airships as carriers almost exactly as present law provides them for steamships. Introduced early in the session the Crosser bill was submitted to the House Committee on Interstate and Foreign Commerce, where it was the subject of hearings at which Admiral Moffett for the Navy Department, F. Trubee Davison for the War Department, and many individuals for the manufacturing and transport interests expressed approval. It is still in committee is not expected out in time for congressional consideration.
To develop American air transport services over seas to encourage the registration in the United States by American capital of American airships for use in foreign commerce and to make certain provisions of the maritime law applicable to foreign commerce by airship (Crosser Bill)	H.R.8081	
To regulate interstate and foreign air commerce (Wallace Bill)	S. 2484	Would delegate the regulation of air commerce, including issuance of certificates of convenience and necessity, to the Interstate Commerce Commission. Has been submitted to the Senate Interstate Commerce Committee, where a crowded calendar has so far prevented consideration.
To increase the efficiency of the Air Corps (James Bill)	H.R. 6600	Provides a separate promotion list for officers of the Air Corps and specifies a method for their promotion and retirement following the lines of the Furlow bill of four years ago. Is still in the hands of a subcommittee of the House Committee on Military Affairs. No public hearings have been held.
To organize a department of national defense (Byrne Bill)	H.R. 7612	Would establish a Department of National Defense, including under a single head the present departments of Navy and War and a united air force. During hearings of the bill the Secretaries of War and Navy and Admiral Moffett, Chief of Naval Aviation, signified their unqualified opposition on the grounds that it would result in reduced efficiency to the services. General Fenlon, Chief of the Army Air Corps, though opposing the present bill, indicated sympathy for the general scheme. Tabled by the Committee on Expenditures in Executive Departments, all hope for the bill is dispelled unless the special economy committee takes initiative in merging the services, a possibility which is remote.
To amend the act entitled "An Act to Authorize the Construction and Procurement of Aircraft and Aircraft Equipment in the Navy and Marine Corps, and to Adjust and Define the Status of the Operating Personnel in Connection Therewith," Approved June 24, 1926, with reference to the number of enlisted pilots in the Navy (Britten Bill)	H.R. 6990	Provides that after July 1, 1933, and in time of peace not less than 20 per cent of the total number of pilots employed in aviation tactical units of the Navy and Marine Corps shall be enlisted men, except when the Secretary of the Navy shall determine that it is impracticable to secure that number of enlisted pilots. Present law requires that 50 per cent of the naval pilots be from the enlisted ranks and allows no exceptions. H.R. 6990 would put the Navy on the same footing the Army has enjoyed since 1926. It has been reported out by the Committee on Naval Affairs but is not likely to get to the floor of the House.
To regulate the conduct and administration of military arsenals, Air Corps depots and other War Department activities and property (Reed Bill)	S. 2378	Contains among other provisions authorization for the use of aeronautical equipment at Wright Field for research purposes by private manufacturers and designers under bond, and providing they defray any expenses involved in the experiments. After being approved by the Committee on Military Affairs it waits on the Senate calendar.

The bill	Number	Its history
To authorize the construction of certain naval vessels for replacement and additions and for other purposes. (Vinson Bill)	H.R. 7631	Both would provide for the construction of one aircraft carrier with its full complement of 144 airplanes at a cost of not more than $27,050,000 and one flying deck cruiser with 36 airplanes at $20,780,000. They would also carry authorization for airplanes to equip the carrier Ranger, now under construction. They have the support of the House Committee on Naval Affairs but have not been reported out on account of the present uncertain financial condition of the government.
To authorize the construction of certain naval vessels and for other purposes. (Britten Bill)	H.R. 6661	
To provide a five-year training program for the training of pilots for an unorganized reserve for the Army Air Corps (Bingham Bill)	S. 4241	Offers a plan to train 100,000 civilian airplane pilots over a period of five years and authorizes the construction of aircraft to carry out the program. Has been referred to the Senate Committee on Military Affairs.
To authorize the design, construction, and procurement of one detachable-combination aircraft suitable for transport purposes for the Army Air Corps (McKellar Bill)	S. 4130	Authorizes an appropriation of $100,000 for the construction of an airplane having a pilot and passenger-carrying compartment detachable from the fuselage and attached to a parachute for its safe descent in case of accident. Since referred to the Committee on Military Affairs, nothing has been heard of it.
To safeguard rights of air mail pilots in collective representation (Mead Resolution)	H.R. Res. 348	Enables the Postmaster General to require the recognition by all air-transport operators of the rights of their pilots to collective bargaining and representation. Penalty for interference is the cancellation of contracts of certificates held by the operators. Was referred to the House Committee on Post Offices and Post Roads.
To authorize appropriations for construction of landing fields, shops, warehouses, gasoline storage, hangars and miscellaneous technical buildings, and installations of Air Corps stations. (James Bill)	H.R. 10087	Providing appropriations of $7,000,000 for the completion of construction projects at 20 airports throughout the country. It is still in committee and in common with many others not expected out in time for legislation.
Aeronautics Branch, Department of Commerce—Appropriations	H.R.9349	Appropriations under two heads. Aircraft in Commerce and Air navigation Facilities, find a place in the bill for the Department of Stain Justice, Commerce and Labor. Passed by the House, when introduced in the Senate, the bill was returned to the Committee on Appropriations with instructions for further cuts of 10 per cent. The Senate accepted the revised recommendations. New figures for the Aeronautics Branch are $504,060 less than originally allowed by the budget, a reduction of about 6 per cent. Of the $8,300,000 now proposed for use in 1933 exactly one million will go in Aircraft in Commerce, barely three quarters of the amount approved by the House, while the new allowances for air navigation facilities represent a cut of about 9 per cent in $7,300,000 of which $200,000 is earmarked for the establishment of a line from Puget Sound to the Twin Cities, the only new construction contemplated. Appropriations in 1932 were $1,360,060 and $5,992,840. Current allowances for the Branch cut these figures by 20 per cent.
National Advisory Committee for Aeronautics—Appropriations	H.R.10822	Included in the Independent Offices Appropriation Bill already passed by the House. $682,010 is provided for 1933, about 7 per cent less than the previous year's allowance.
Post Office Department Appropriations	H.R.9600	Appropriations of $7,000,000 for foreign air mail and $16,000,000 for domestic contracts 9 per cent below the 1932 figure, were approved by the House and are now in the hands of a Senate committee, under specific instructions from the Senate in rul the total amount of the bill at least 10 per cent.
Post Office Department Investigations	S. Res. 48 H.R.9841	Criticism of the administration of the Walres Act by the Post Office Department and charges of monopoly and discrimination against independent operators precipitated hearings by the House Post Office Committee, of which Rep. Mead of New York is Chairman. Committee bidding for all extensions of route, the wage policy of operators and negotiation of air lines by a federal commission were discussed by Postmaster General Brown, F. L. Cord, and other interested individuals. Recommendations to propose or oppose legislation will be postponed until after the completion of an investigation to be held by the Senate under the McKellar Resolution. A special subcommittee under the chairmanship of Senator Oddie of Nevada will conduct the Senate hearings.
Navy Department Appropriations		Bills covering Army appropriations are still in committee. Budget estimates for 1933 allowed $52,145,000 for the direct purposes of military and naval aviation, a cut of 10 per cent from the previous year's figures. The Army Air Corps is allotted $25,483,000 instead of $31,480,000. The Bureau of Aeronautics was cut by the budget in an effective total of $24,460,000 from the 1932 appropriation of $30,847,000. The bill as brought out by the House committee makes a further reduction in $23,198,000. The allowance for new aircraft is down from $11,000,000 to $5,000,000.
War Department Appropriations		
Department of Agriculture—Weather Bureau Appropriations	H.R. 7918	The Agricultural Department Appropriation bill, which includes $1,554,000 for the meteorological work of the Weather Bureau for the benefit of aviation, has passed both Houses but is tied up in conference by differences concerning pay rates. The allotment for aeronautical work is $227,000 less than that for the current year.
General Tax Bill	H.R.10236	As originally proposed by the House Committee included a tax of 6 per cent on all airplanes produced. The levy was stricken out before the measure reached the floor of the House.

STATISTICS OF THE MONTH

Supplementing the statistical issue of AVIATION, *March, 1930. Page numbers refer to that issue.*

AIR MAIL
(page 107)

WITH the receipt of a final report of air mail service for December it becomes possible to give the corrected totals for 1931. With marked conservatism the Post Office Department underestimated air mail traffic for the last month of the year, notably in the case of mail carried, where actuality exceeded the prediction by more than 100,000 lb. Final December figures, while changing the annual totals no more than 1 per cent, make a vast difference in the monthly poundage chart. It may now be said, with no exceptions, that the curve of air mail poundage for every month of 1931 maintains a position well above any preceding year. While in no case is there a change in route total for the year of more than 3 per cent, the Post Office December estimates were farthest astray on poundage carried and miles flown on the Salt Lake City-San Diego route and on the routes from Chicago to San Francisco and New York.

Mail Carried by Routes for 1931
Corrected report

	Mileage scheduled	Mileage actually flown	Total weight of mail dispatched (pounds)	Average weight per scheduled trip	Amount paid to contractor	Average compensation per mile flown
American Airways						
1 Boston-New York	200,335	227,592	135 730	106	$153,244 00	$0 68
1. Boston-Bangor[1]	21 012	14,871	1,502	14	9,022_66	0 61
2. Chicago-Memphis	475 468	441,912	67,577	585	262 182_57	0 59
20. New York Fort Worth[2]	1,251,442	1,121 500	204 926	216	698,825_86	0 62
21 Dallas-Galveston	246,094	234 456	37 230	51	139 058_77	0 59
22. Dallas-Brownsville	402,611	396 283	86 057	118	248,519_27	0 63
23 Atlanta-New Orleans	356 300	341 958	101,342	138	215 738_16	0 63
24 Chicago-Cincinnati	403 661	375 602	85 715	57	241 925_19	0 64
29 New Orleans-Houston	256,170	254 083	51 019	70	111 825_58	0 44
30. Omaha-Atlanta[3]	1 352,233	1 259 385	321 774	254	745 459_81	0 60
33 Atlanta-Los Angeles	2,020 291	1 888 869	245 489	533	1 645 531_66	0 87
Total	7 031 037	6,316,313	1 334 241	...	$4 469 333_22	$0 69
Eastern Air Transport						
19 New York-Miami[4]	9 490 392	3,240 159	949 306	475	1,974,723 84	0 61
National Parks Airways						
26. Great Falls-Salt Lake City	648,297	635,214	82,957	54	365 673_00	0_58
Northwest Airways						
9. Chicago-Pembina	1,478,581	1,422,767	276 001	287	912 532_71	0_64
Pennsylvania Air Lines						
11 Washington-Cleveland	466 044	585,800	91 111	51	171 149_76	0 44
Transamerican Airlines						
27 Bay City-Chicago	1,241 522	1,151 895	182 583	299	617 125_79	0 54
Transcontinental & Western Air						
34 New York-Los Angeles	3,437,913	9 089 533	595 047	300	1,816,801_68	0 59
Western Air Express						
4 Salt Lake City-San Diego	1,042,879	1 027 825	657 445	900	930 555 42	0 90
12. Cheyenne-Albuquerque-Amarillo	355 174	359 461	107 704	148	201 612 74	0 60
33. Albuquerque-El Paso[5]	67 200	66 096	3 157	103	32 269 09	0 79
Total	1,465 055	1,453 402	768,284	...	$1 184 237 25	$0 85
United Air Lines						
3 Chicago-Dallas	1 856 947	1 681 682	515 400	350	1,199,794 83	0 71
5 Salt Lake City-Seattle	1 283 407	1 218 163	342,920	476	931 279_09	0 78
8. Seattle-San Diego	1 586 763	1,331 459	410 643	374	897,880 74	0 66
17 New York-Chicago	2 086 748	1,825 582	1 725,197	675	1,493 511 79	0 82
18. Chicago-San Francisco	4 204 275	4,102,715	1 851 788	912	3,760 910 56	0 92
Total	10,817 842	10,179 601	4 826,928	...	$8 805 176_81	$0_81
United States Airways						
30. Kansas City-Denver[6]	200 192	186 542	12 759	35	75 416_80	0_40
Total	38 274 675	28 254,226	9,099,797	...	$19 890 176_26	$0_70

[1]Inaugurated Aug 1, discontinued Sept. 30. [2]Includes route 18 from Cleveland to Louisville, with which it consolidated June 1. [3]Includes route 28 from St. Louis to Omaha, with which it consolidated May 15. [4]Includes route 25 from Atlanta to Miami, with which it consolidated April 1. [5]Inaugurated Aug. 1. [6]Inaugurated June 5.

PRODUCTION AND LICENSING
(pages 220-200)

CURVES showing current airplane production need little comment. Commercial production in January dropped to a new low of 28 planes, barely half the 1931 figure, a ratio of reduction which also held true for automobile production in the first quarter of 1932 as compared with last year. Military production, of ever-increasing importance to the aeronautical industry, brought total January output up to 74 per cent of the previous year's figure.

Decline in production has not as yet managed to pull the curve of total planes legally approved to below the levels reached at the end of the summer. After rising at the rate of almost 200 planes a month between May and September, however, the number has continued almost static, with more than slight weekly variations occurring only at the end of February, when a 1932 peak of 10,782 was reached, perhaps in preparation for the business to be induced by the National Aircraft Show. Total planes at the same time last year hovered about the 10,000 mark. Identified, rather than licensed, planes are responsible for the recent firmness of the curve for total planes. While licensed planes follow an irregular downward course from the summer peak of 7,700, the number of those identified increases consistently at the rate of between 40 and 50 a month.

Personnel pictures no longer exhibit the striking trends which characterized them in 1931. The total of student permits valid is now dropping at the rate of 150 rather than 250 a month. Licensed pilots, instead of increasing in number at that same rate, show a tendency to stabilize at around 17,700.

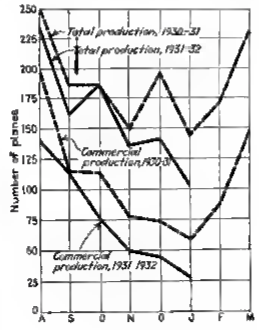
An estimate of the number of students receiving their first approval as pilots may be made by subtracting from the number of student permits issued during the year the number valid at its end. Assuming that the remainder have obtained licenses to fly, 3,295 novices took to the air in 1931, almost 19 per cent of the total number of licensed pilots. Allowance for those who died or had student permits revoked before the expiration of their one-year term, and without completing their pilot license requirements, however, probably brings the total of new pilots down to about 3,100.

The good start to which the 1932 curve for the average weekly issuance of pilot's licenses got off is the outstanding feature of the seasonal charts. After exceeding the weekly rate of January, 1931, by almost 10 per cent, however, the rates for the two succeeding months dropped to points about a third below last year. The seasonal curve for student permits issued follows in general the course of the preceding year, at points from 10 to 30 per cent below its level.

Scheduled Air Transport Operations
(Second half 1930 and 1931)

	1930	1931
Airplane miles	16 611 646	25 133,003
Number of passengers	192,931	281 610
Passenger-miles	47,766 146	70,743,243
Express poundage	148 734	497 424
Gasoline consumption (gal.)	3 685 755	10 506 372
Oil consumption (gal.)	175 327	521 119

Figures for above table compiled by the Aeronautical Chamber of Commerce



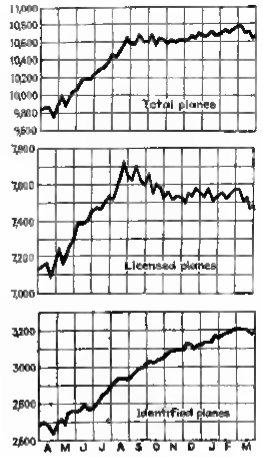
Seasonal curves of commercial and total airplane production

Makes of Newly Licensed and Identified Aircraft
(First quarter, 1932)

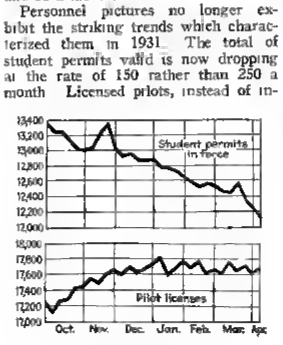
	Licensed	Identified	Total
Aeronca	10		10
Bellanca Skyrocket		8	8
Bellanca Pacemaker		1	1
Bird	5		5
Consolidated Fleetster	2		2
Curtiss-Wright Amphibions		2	2
Curtiss-Wright Travel Air Biplane	4		4
Cyclaplane	2		2
Detroit-Lockheed Sirius	1		1
Detroit-Lockheed Orion	3		3
Nicholas-Beazley	15		13
Eaglerock	0	3	3
Fairchild	0	15	15
Heath	1	10	11
Kellett Autogiro		1	1
Manocoupe	3		3
Pitcairn Autogiro	1	10	11
Stinson Airliner	2		2
Stinson four-place	17		17
Taylor		5	5
United Boeing 1 engine	3		3
United-Sikorsky 2 engine	3		3
Waco — Open	5	1	0
Waco — Closed	6		6
Miscellaneous	15	42	57
Total	98	97	193

Makes of Engines in Newly Licensed or Identified Aircraft
(First quarter, 1932)

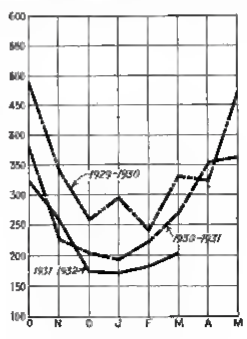
	Licensed	Identified	Total
Aeronca	10		10
American Cirrus		13	13
Continental	10	0	10
Cyclometer	2		2
Ford		10	10
Genet	15		15
Harley-Davidson		3	3
Heath	1	4	5
Heath-Henderson		4	4
Henderson		6	6
Hispano-Suiza	1	2	3
Kinner B-5	4		4
Kinner C-5	1	1	2
Kinner R-5		10	10
Lambert	1	1	2
Lambert Velie	1	2	9
Le Blond	1	1	2
Lycoming	10		18
Glenn L. Martin	1	1	2
P. & W. Wasp	8	8	16
P. & W. Wasp Junior	1	1	2
P. & W. Hornet	2		2
Ransley	2	4	6
Warner Junior		1	1
Warner Scarab	2	1	3
Wright 165	2	1	3
Wright 220	1		1
Wright 240	3		3
Wright Gipsy		1	1
OX3		4	4
Miscellaneous	2	0	11
Total	98	97	195



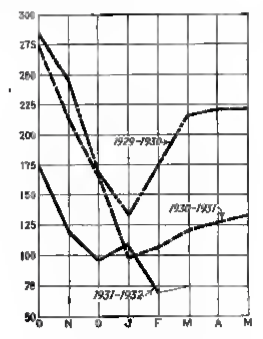
Valid airplane licenses and identifications



Valid pilot licenses and student permits in force



Average weekly issuance of student permits



Average weekly issuance of pilot licenses

SIDE SLIPS

By Robert R. Osborn

THIS year there really was one outstanding exhibit at the aircraft show,—one display which had people around it in rows six deep night and day,—the new Ford V-8 automobile engine

One airplane manufacturer had a very nice exhibit of one of his newest models, with an uncovered skeleton of the same airplane alongside of the completed one We were planning on sneaking in early one morning to place a sign, half

way between both ships lettered "Example of Modern Production Assembly Line for Commercial Aircraft." However, as we didn't get up early any of the mornings we were there, we never did get around to placing that sign

By the way, this is a good time to inquire why we call them "commercial" airplanes and engines? If we sell them to the butcher, baker and candlestick maker for their own use, as we hope to some day, they aren't going to be any more commercial than is the Ford automobile. So, why not start calling them "civil" aircraft, which is a much prettier name, in our opinion?

Just before the opening of the show there were an unusual number of mysterious mergers and combines, and rumors of more, which affected most of the large aviation groups As a consequence many of the boys at the show didn't know who they were working for, if anybody The favorite game, when the boys got together to talk over the latest scandals, was "Company Company, who has got the Company?"

There was a model airline in operation at the show, carrying passengers on a tour of nearby fields for $5. The ticket sellers were drumming up trade in the crowds watching the flights in the same old way that flight tickets have been sold ever since the first passenger was carried in an airplane Of course aviation can never claim to be a grown-up business so long as thrill rides can be sold to the crowd, but somehow we were glad to hear the persuasive voice of the ticket seller again It seemed to reassure us that there was a bit of the old romance left in the game, that all would soon be right with the world and that Spring was with us again

At Mitchel Field, on Long Island, there used to be one sure sign of Spring when the old gigantic "Owl" airplane was taken out for its annual flight over the countryside After countless hammers, tool boxes and cylinders had been purposely dropped through the wings of the old Owl, it finally went to the Happy Landing Field, so now the only true harbinger of Spring we have left, aeronautically speaking, is the cry of the ticket seller. Long may he wave.

We've always claimed that the clever fellow can get ahead very well, even in times like these—which is preliminary to saying that we think the Irvin Parachute people had one of the cleverest rackets we have ever seen at a show

They were demonstrating a new type of safety harness, which is designed to fasten one securely in the seat and against the back of the seat, no matter what the attitude of the airplane might be They had a sample of the harness on an airplane seat which was mounted on an open framework so that it could be rotated completely around and upside down

Their procedure in the demonstration was simple and effective. The prospect was strapped into the seat and immediately inverted If no change fell out of his pocket he was immediately turned rightside up removed from the harness and sent on his way with no more sales talk wasted on him If change did fall out of his pocket, the sales talk was continued with increased enthusiasm, for here was a prospect who might pay cash for an order. And, we are certain, the money which blew or rolled under the furniture of the booth, was more than enough to cover expenses.

Another new racket, and equally clever, was that of our friend "Jerry" Jordanoff, who has turned to authoring, and who was selling his new book "Flying, and How To Do It" in large quantities A good book it is too, having some sound flying advice, illustrated with clever cartoons, available for the fledgling pilot. We looked through it and noticed that Jerry neglected to suggest whose airplane we should fly, nor

did he list any places where one can still get away with simply signing credit slips for gasoline

The following letter was sent to Maj Melvin Hall in Paris, from an inventor in a European country, so we feel safe (from hurting the feelings of the author) in printing what we consider a very funny letter:

Dear Sir: Beg to call up your attention for a special safety mechanical instrument, which is asure and stop the flying machine to fall down. How this instrument are working the following writting certificate explain what certificate was giw out under the Budapest Josef Scientific University's opinion.

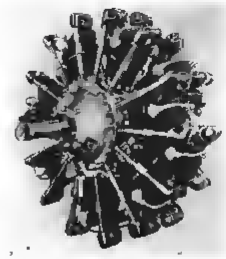
Writting Certificate Triangle shaped dropingumbrella, wich is when folded izey to put on the upper body, behind the pilot sett This umbrella could be filled in two side. Namely that place on the body, where the vings are come out rought 8 left side 1-1 botle filled with Helium gas 150 Athmospher, get place This helium will fill the umbrella and open wery quikly. In case any trouble happen on the machine,—on the mech board has a button; when that button puled,—the helium bottle valve opened, from the valve to the umbrella true a pipe lead the helium! The pressed gas puffed the umbrella, while openself and liftingself over the whole machine, and stop to fall the aeroplane, and put them straight Falling conditions. The pressed helium gas work sure and servequik opening the folder work are the same, like the dropingumbrella The umbrella holder guide beetven the central body and the back vings employed, and the mechine become under the umbrella—mean the umbrella cover the machine in case the machine vaobling

Now my dear sir! If you interest ing about how this instrument are vorking and if you Sir, like a original drav ing! Kindly send your worthy ansver, and Y will mail you one at soon"

FLYING EQUIPMENT

Compact power—the Twin Wasp Junior

ALMOST 2 in. less in diameter and only 7 in greater in length than the standard Wasp Junior, but developing over twice its rated horsepower, the new Twin Wasp Junior, exhibited for the first time at the Detroit Aircraft Show by Pratt & Whitney Aircraft Company of Hartford, Conn., is probably the most compact aeronautical power unit so far produced in the United States Its specific weight (bare) is only 1 33 lb per hp The general specifications for the engine were laid down by the Bureau of Aeronautics, Navy Department, to decrease head resistance for high-speed airplanes, and to improve the forward vision over that possible with a single row of cylinders in a radial air-cooled engine of equal displacement The new engine, with a displacement of 1,535 cu in. has an overall diameter of 43⅜ in as compared with the 51½-in diameter of the 1,344-cu in displacement Wasp "C" and the 55⅞-in diameter of the 1,690-cu in Hornet "A."



The P. & W. Twin Wasp Junior

The cylinders, which correspond very closely to those of the Wasp Junior, are arranged in two staggered rows of seven each in a three-section crankcase. The center section comprises one half of the main case for front and rear banks, while the front and rear main sections complete the main case assembly Both carry the cams and tappets to actuate the valve mechanism for the two banks The front section incorporates a thrust bearing and supports for the front end of the crankshaft, and is fitted with a built-in valve for the operation of a Hamilton standard controllable pitch propeller It is also provided with special scavenging means for returning oil to the main tank during a steep dive The rear case includes the blower section and auxiliary drives similar to those used on other Pratt & Whitney engines,

The crankshaft is a one piece forging having two throws set at 180 deg It is supported on four bearings The master connecting rods are of two-piece construction and carry steel backed bronze bearings which operate on hardened crank pins The link rods are similar to those used on the Wasp Junior, and pistons, valves, etc., are similar to those used in other P & W designs Mounting lugs are cast on the blower section.

The accessory section carries two Scintilla shielded magnetos, oil pumps fuel pump, Stromberg carburetor, special combination hot spot and oil temperature regulator, and connection for starter, gun synchronizer, tachometers, generator, etc The supercharger drive is similar to the standard design, but has increased clutch capacity.

The engine is to be built in both direct and gear-drive types For the latter, a 3:2 planetary reduction gear of compact design is used, and its application adds approximately 80 lb to the weight of the direct-drive engine

The general specifications for the direct-drive engine, as released by the manufacturer, are as follows: Designation-Twin Wasp Junior, R-1535, direct drive, air-cooled fixed two-row radial, number of cylinders, 14; bore, 5⅛ in., stroke, 5⅛ in., displacement, 1,535 cubic inches; compression ratio 6:1, blower ratio, 10 1, rated power, 625 hp at 2 100 r.p.m.; weight, 830 lb (bare); length overall, 48¼ in.; diameter overall, 43⅜ in.

Kinner folding-wing two-place monoplane

A folding-wing Kinner monoplane

W. B. KINNER, founder of the Kinner Airplane & Motor Corporation, has recently organized a separate company to manufacture a new airplane, aimed particularly at the sportsman market. The machine is a two-place open cockpit, low-wing monoplane of more or less conventional appearance, but involving a feature which, although not heretofore popular in this country, is common in European light plane practice—the folding wing With wings folded, the plane has a span of 9 ft., and may easily be stored in a private garage of ordinary dimensions. When folded back against the fuselage, the wings are so supported that the plane may be towed behind an automobile.

The power plant is a standard Kinner K-5, 100-hp engine driving a two-bladed wooden propeller The landing gear incorporates spring type shock absorbers and individual wheel brakes

The specifications announced by the manufacturer are: span, 36 ft.; length overall, 24 ft., height overall, 8 ft.; wing area, 200 sq.ft.; weight empty, 900 lb.; useful load, 700 lb.; gross weight, 1,600 lb

Approved type certificates

DURING the period March 18 to April 15 the Aeronautics Branch of the Department of Commerce issued the following Group I approved type certificates: 461, Stearman Alpha 4A (P. & W. Wasp SCI 450 hp.), 462, Lockheed Orion 9B (Wright Cyclone R1820E 575 hp.); 466, Waco RCA (Warner Searab 110 hp.); 469, Rearwin Junior 4000 (Aeromarine AR-3 50 hp.) 471, Kellett K3 Autogiro (Kinner C5 210 hp.). The following have been issued for engines: 80, Continental R670,210 hp at 2000 r.p.m. 81, Jacobs LA2 195 hp at 2075 r.p.m.

WHAT OUR READERS SAY

On using the air mail

TO THE EDITOR:

Air mail has been the backbone of American air transport throughout its entire history. Continued expansion of transport operation depends very largely upon insuring the progress of the air mail toward self-support.

The present deficiency of about $10,000,000 per year in air mail revenue can be eliminated, and at the same time the public can be served with faster ships and a more frequent service for mail, passenger and express. The need is for more volume. It can be secured and at a profit to the government.

In June, 1928, when the air mail was reduced from 10 to 5 cents, there was an increase in poundage of over 100 per cent in the next six months. Now there is a threat of increase to 7 or 8 cents, to keep pace with the 3 cent rate proposed for train mail. Since the average business letter (check those on your desk) is less than 500 words, and this class is now going almost entirely by rail, why not use a light-weight single-fold combination letter-envelope, about 8x8 in., with perforated and gummed margin in the familiar air-mail colors, weighing six to the ounce at 4 cents each? This is a gross income to the Post Office Department of $3.84 per lb. as against $1.32 for the present air mail letter (at the current air mail average of 26½ letters to the pound).

The local handling cost of a piece of first-class mail is 1.36 cents. This leaves 96 cents per pound in the case of the present air mail letter, to apply against transportation. With the six to the ounce letter-envelope, a net revenue more than two and one-half times as large or $2.54, would be applicable to transportation costs. Even at 3 cents, the new form of mail would show a net applicable to transportation charges of $1.58 a lb.

It is therefore obvious that a 40 per cent increase in air mail poundage by this light weight letter-envelope would eliminate the air mail deficit and put aviation solidly on its own feet and in a position to offer better service to its public without dependence on a government subsidy.

The suggested letter-envelope is not intended to replace the present air mail letter, which carries an entirely different class of correspondence such as checks, drafts, stock certificates, and letters of several pages. It is designed to offer a supplementary service to take care of ordinary business correspondence. The diversion will be from rail mail, at a premium charge of but 1 cent.

This class of mail is designed to divert from rail to air, regular business letters, 90 per cent of which are short enough to be easily carried on an 8x8 sheet at only a 1-cent premium over the proposed 3-cent rail rate. There is little probability that it would detract from the poundage of longer, more formal, letters, and documents now being carried at 5 cents.

The operators are spending large amounts of money in soliciting comparatively unprofitable passenger business. A passenger and luggage weigh about 200 lb. and require about 45 cu. ft. of space. Air mail averages 9 lb. to the cubic foot. Passengers are bulky, move in volume only in good weather, require heavy slow-moving tri-motors, and solicitation expense. A smaller, faster ship can carry a much more compact and more profitable load in mail in much worse weather. Why not double the frequency of service and halve the passenger capacity and greatly increase the revenue by handling more air mail poundage in fast, single engined planes like the Boeing Monomail, the Northrop Alpha, or the Consolidated Fleetster?

Not enough businessmen know the possibilities of our 32,000 miles of air mail routes. Why not print a map of the United States on the reverse side of this letter-envelope, showing the scheduled air mail routes in red, with the names of the cities in blue? This would be potent advertising, and permit a stenographer to easily carry out instructions from her employer to "send all mail by letter-envelope by air between cities on the mail routes."

Aviation has a service to offer to the public. Other means of communication offer reduced rates for deferred service, such as night letters, night messages and day letters with Western Union and Postal, and with A. T. & T. low rates after 8:30 p.m. We should increase our volume and our revenue, and give a more frequent and so a better service, by offering a reduced rate for business correspondence of 500 words or less. It offers the public a reduction, and yet would be one of the most profitable pieces of mail handled by the Post Office.

Why not, as a taxpayer and a friend of aviation, anxious to see its development, write at once to the Postmaster-General, and ask your friends to do so, urging a consideration of this suggestion?

A. L. RUSHTON,
Omaha, Neb.

[Mr. Rushton's plan appeals to us greatly. It wouldn't be the solution of all the difficulties in the world, and it wouldn't work any magic over night. We do believe, however, that it would materially increase the amount of air mail despatched, would increase the income of the air mail lines, and at the same time reduce the Post Office deficit on the air mail service. Our favorable opinion of the scheme is developed at greater length on the editorial pages. —Ed.]

5,000 miles cross country

TO THE EDITOR:

I thought you might be interested in the statistics which I have carefully kept of a 5,000-mile cross country trip to New Mexico and Arizona which I have just completed. I flew three passengers and we visited Meteor Crater, the Grand Canyon, and Apache Trail in Arizona and the Carlsbad Caverns in New Mexico. Our ship was a cabin Waco, powered with the 170-hp. Jacobs.

Our route took us through 23 states and the altitudes of the fields on which we landed varied from 3 to 7,300 ft. above sea level. We encountered temperatures varying from 5 below to 95 deg. F. At Las Vegas we were forced down on the mesa by an approaching snowstorm. The altitude here was over 7,000 ft. We took off the next day in eight inches of snow after a run of approximately 700 yd. This was with a full load of four people and 60 lb. of baggage. After taking off we climbed over Glorietta Pass at 11,000 ft. It was a lot to ask of only 170-hp. but the engine took us over without any trouble and kept on running as smoothly and steadily as it did all of the trip. Never once did it miss or give us any trouble.

You will notice by the tabulation below that we carried every kind of insurance and that the cost of this plus depreciation was half again as much as the total operating cost. Even with this burden of exorbitantly high insurance premiums the cost per person per mile was less than 4 cents.

Total mileage	5,070
Average speed (m.p.h.)	98.2
Gallons of gas per hour	12.2
Quarts of oil per hour	1.5
Cruising r.p.m.	1,958
Total operating cost (including storage 220-hour checks, washing and all incidentals but not insurance or depreciation)	$322.59
Cost of repairs or replacements	None
Cost per mile	$0.064
Cost of public liability, property damage, passenger liability and crash insurance	$263.55
Depreciation, plane and engine	$186.00
Cost per mile including all above	$0.156
Number of landings (five not on airports)	45

I believe that this trip certainly showed the great dependability, performance, comfort, safety, and economy of our modern aircraft.

LEWIN B. BARRINGER,
Assistant Field Manager
Wings Corporation of Philadelphia

TRANSPORT

Operations and Traffic Management

Cabin advertisements add to airline income

WORKING on the proposition that airlines need to develop by-products in order to secure maximum income Air Ads, Inc., was organized in 1930 to introduce card advertising in passenger transports. The airline's income from advertisements is derived from a percentage of the fee paid by the advertiser. All expense of promotion of contracts, provision of frames for the cards and allied incidentals is borne by the Air Ads company. In the eighteen months of its operation arrangements have been made to install cards on seven lines carrying approximately 330,000 passengers per year. A number of other lines have expressed their approval of the project and at least two advertisers have renewed their long-term contracts.

It is frankly stated by the company that further exploitation of the idea depends to a large extent on the improvement of general business conditions. One or two of the largest operators have been won over to the idea and will be in a position to handle anywhere from fifteen to twenty cards per plane as the number of advertising contracts grows. In the meantime the experience of the lines adopting the plan indicate that, particularly on the short-haul services, utilization of space for card display may prove an important source of revenue.

A certain amount of opposition to card displays has been expressed by some operators, chiefly on the ground that the cabins might come to look like the interiors of street cars. Operators have sought to make the cabin comparable in decoration and comfort, as far as possible, to Pullman cars and it was feared the type of passenger usually attracted to air travel would be annoyed by card displays.

Thus Air Ads has made a special effort to provide cards and frames which would be attractive as well as effective, and to arrange them in a pleasing manner. Lines using the cards feel that the cards may have an important psychological value from the point of view of the passenger, especially the inexperienced air traveler. Lines on which cards have been displayed are Ludington, Transamerican, Gorst, Century, Century Pacific, Braniff and Pennsylvania.

Chinese traffic agent contacts Orientals

PASSENGER traffic solicitation among Chinese people has been greatly facilitated by the Los Angeles traffic office of American Airways through the appointment of a Chinese ticket agent, Ki Lung Chan, whose Chinatown office directly serves the Oriental population of southern California. Mr. Chan is an outstanding figure among the Chinese merchants of Los Angeles and his art goods store in the business district as well as his dry goods shop in the Chinese quarter, ably serve as airline ticket offices.

Air travel has proved quite popular with Oriental people in this country since it has been found that this method of personal transportation greatly facilitates inter-city trade. The principle cities involved in their import and export business are San Francisco, Los Angeles, and New York.

Loading packages received from a mail order house for transfer to Cincinnati for mailing. Transportation of packages part of the distance by air cut appreciably the time required for delivery all the way by mail

Special airline rates for students

LUFTHANSA, the German transport company, last summer introduced a traffic innovation which met with great success. During August and September, the vacation and travel time for college and university men, students were carried on regular transports at fare equal to the third class railway charge, when seats were available. In other words, if a plane was fully booked at the full rate per seat (approximately first class railway fare), no students were accepted for that trip. Rather than operate with one or more seats empty, however, the special arrangement provided for some appreciable revenue. About 1,000 took advantage of the offer last season.

Plane shipments speed mailings

CENTURY AIRLINES introduced the promising scheme of carrying packages from a mail order house in Chicago to Cincinnati daily as part of a plan to speed up the transportation of goods from the store to the purchaser. The packages for the Southeast were placed in the mail at Cincinnati on the day of mailing rather than in the Chicago post office, saving considerable time. The work was done under contract.

Traffic representatives form a club

AN ASSOCIATION of traffic representatives in the New York metropolitan area has been organized by the employees of all lines serving the area. No executives are included. The association has been operating since early in February and has already justified itself as a social medium and opportunity for the exchange of ideas and experiences in traffic promotion.

SERVICING SHORT CUTS

A kicker engine for seaplanes

FOR taxing seaplanes and flying boats from shops to loading ramps in congested harbors where an attempt to maneuver under engine power would be obviously impractical, the Gorst Air Transport Company, operators of regular passenger service between Seattle, Bremerton and Victoria, are making use of regular outboard motor boat engines and propellers. A standard Johnson Sea Horse '32" outboard motor can be mounted on a bracket near the tail of the airplane, and used to furnish power on the water. Equipment of this sort is useful not only for local maneuvering but might also serve to bring in an airplane forced down on the water due to engine trouble.

Small equipment in the shop

SMALL power tools ordinarily mounted on the shop work benches are placed on special standards out on the shop floor at the Arbogast Aero Shop, Long Beach, Cal. This practise saves small machines from minor damage, and by putting them out in the open they are made more accessible for small jobs. For example, the Van Dorn electric grinder, semi-portable electric drill press, and Black & Decker electric valve refacer are mounted on individual supports made of standard 4-in. well casings bolted to the concrete floor by means of standard heavy flanges. The machines are mounted on similar flanges on the upper ends of the pipe standards. Electric current is brought from the overhead wiring system through individual pipe conduits, thus keeping the floor area unobstructed.

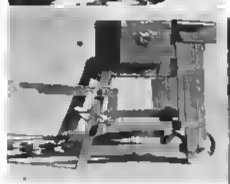
Convertible unit for small woodworking

THE Black and Decker 7-in. bench grinder in the repair shop of the Pacific Technical University, San Diego, has been made to do duty as a circular saw for small woodworking jobs through development of an ingenious hinged table which may be swung down for sawing, or may be lifted out of the way when the tool is being used as a grinder. When a job of sawing presents itself a circular saw is bolted to the head end of the motor shaft, and the table is lowered into place. The free end of the table rests upon an adjustable screw by which the depth of the saw cut can be controlled. A conventional work guide to regulate the width of the cut is incorporated in the table top.

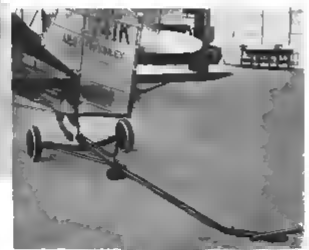
A battery "barrow" and a tail dolly

A SIMPLE battery "barrow" has been developed by the mechanical personnel in the Seattle hangar of United Air Lines to facilitate the work of removing batteries from the company's single-engined and tri-engined transport planes for re-charging. During the winter months especially United Air Lines finds that batteries must be re-charged frequently and considerable labor is involved in removing the batteries from the planes and carrying them across the hangar to the charging station. The company's personnel, therefore, developed a small two-wheeled truck with a rack on which the battery may be placed and sent quickly and effortlessly across the hangar. The truck was built up of welded steel tubing. As batteries on the company's tri-engined airliners must be re-charged after every flight, the battery barrow saves considerable time and effort.

An efficient dolly to place under the tail of planes which must be moved in a hangar also has been produced by the Seattle personnel of United. The dolly, fabricated of welded steel tubing, embodies a lever action to expedite placing under the tail and lifting the plane up.



Portable work bench at American Airways' Dallas shop. At top: An outboard engine on a Gorst seaplane.



The small truck that aids battery handling and (above) an efficient tail dolly at United's Seattle hangar

Portable tool kit and work bench

A TOOL BOX, work bench, and adjustable servicing platform mounted on wheels has been developed by mechanics of the American Airways shop at Dallas, Tex. The device is simple in construction, and can be made up of materials which are readily found around the average shop. Devices of this sort may take a variety of forms to suit local conditions. The convenience afforded by their use will many times repay the small cost involved.

AIRPORT MANAGEMENT

Radio and movies promote interest in airport

RADIO talks are being used by the management of Floyd Bennett Field, New York City's municipal airport, to develop general community interest in aviation, and to publicize the airport. Each week a member of the staff makes a fifteen-minute broadcast over station WNYC, the municipal station devoting most of the period to answering questions on aeronautics submitted by mail in response to invitations made at previous broadcasts. When expedient the facilities provided by operators at the airport and special services such as the special trips to Lake Placid during the winter Olympics, are emphasized.

There is a constant demand from civic organizations for speakers on aviation subjects and the airport staff takes turns filling those engagements. The lectures often are supplemented by motion pictures of activities at the port made by a member of the staff with his own camera. This has proven to be an inexpensive and very effective publicity medium.

Above: Beacon equipped with Model 609 photronic illumination control relay. Left: The public address system installed on the roof of Wayne County's control tower, which commands a view of the field.

Students instructed with airport model

THE British College of Aeronautical Engineering at Brooklands aerodrome is using a scale model of the airport on a large table for instructing students in proper methods of approach to the field from various directions and in proper observation of ground signals. The instructor moves the miniature wind cone to various quarters and in each case has the pupil describe the proper direction of landing and the exact area on the airport in which he would attempt to land.

This method has been very successful in teaching rules of the airport, principles of landing and taking off, and instilling confidence in making decisions.

Loud speakers aid management of airport

WAYNE County Airport considers its public address unit essential for the proper coordination of movements of employees and patrons throughout its large building and field area. The system, installed by Western Electric, consists of two amplifiers in the hangar and two on top of the control tower on the hangar roof. The hangar measures 434x128 ft. and is usually well-filled with planes. Without the public address system it would be difficult to contact individuals for instruction, telephone calls and other messages.

The two horns on the roof are attached to a pole which can be rotated 360 deg. The horns can be aimed vertically through an arc of about 180 deg. To each horn are attached nine receivers and this combination has enabled the voice of the operator to be heard distinctly three and a half miles away in still air. Pilots of planes taxiing or with engines idling can be contacted easily by the operations manager, an obvious advantage from the point of view of safety and efficiency.

This communication device supplements the telephone switchboard, and the usual controls for the field lighting and signalling units housed in the tower.

A new cell to control lights

A NEW instrument which promises to be of considerable value to airports and unattended emergency fields and beacons has been installed at Bowie, Md., for service tests. It is the photronic cell, produced by the Weston Electrical Instrument Corporation, of Newark. The cell is a light sensitive device that will actuate relays, switching on the beacon or floodlights when an unusually cloudy day, fog, or smoke require lights, as well as control the lights at dawn and twilight.

One of the features of the installations is a time-delay relay which prevents the closing of the circuit until a predetermined interval of time, approximately a minute, has elapsed after the drop in light intensity. This accessory renders the system insensitive to temporary fluctuations in light intensity due to clouds and other causes.

The airport installation consists of two parts, the light collector and the relay cabinet. The lead resistance between these units does not effect their operation and they can be located any reasonable distance apart. For this reason, only the light collector is made weatherproof. This unit contains three photronic cells and the necessary outlet for standard ½-in conduit. In the relay box are housed a Model 534 sensitive relay with contacts adjusted for a minimum intensity of 15 foot-candles, the time delay relay, and the power relay which is capable of handling 110-volt circuits up to 3,000-watt capacity. A small transformer, to provide local current for the time-delay relay, also is provided. Complete control may be obtained from circuits of standard voltage or direct current sources as low as 6 volts.

The Department of Commerce is making an exhaustive test of the device at the present time with installation at its outlying intermediate fields in view.

THE BUYERS' LOG BOOK

Airport tractor

Eight W & K heavy duty Tugs, a new type of gasoline tractor, designed and built by the Whitehead & Kales Company of Detroit, Mich., have recently been delivered to the Army Air Corps for service on flying fields. These machines are compact four-wheel units, in which many of the parts are those of the standard Ford AA truck. The machine is 96 in. long and 52 in. wide, and has a turning radius of about 98 in. The normal drawbar pull is 1,200 lb. which can be increased, by the addition of weights over the rear axle, to 2,600 lb. One reverse gear and four forward speeds, ranging from 3 to 20 m.p.h. are available. The machines are designed either to push or pull loads, and are also adapted for the attachment of auxiliaries such as rotating brush sweepers, snow plows, or similar equipment.—AVIATION, *May, 1932*

Electric screw-driver

The Stanley Electric Tool Company has recently brought out a new lightweight electric screw-driver.

The outstanding feature is the ingenious clutch mechanism designed so that it releases at the exact pressure for which it has been set. This prevents the screws from going too deep in the wood, prevents marring the surface of the work, prevents damaging screw slots, sets screws up tight and eliminates hazard of overloading motor or stripping bolt and screw threads.

It weighs 4¼ lb. and will drive up to No. 8 screws in hardwood and No. 10—1½ in. screws in soft wood. With socket wrenches it will run out nuts up to ¼-in. machine screw size.—AVIATION, *May, 1932*

Connecting rod balance

To facilitate balancing automobile and aircraft engines connecting rods, the Toledo Precision Devices, Inc., subsidiary of the Toledo Scale Company, of Toledo, Ohio, has announced a new testing gauge. The device consists of two separate machines, the first of which performs the initial weighing of the connecting rod. Instead of weighing each end of the rod separately, as is usual practice, both ends of the rod are attached to the machine at the same time, and two scales register simultaneously the amount of overweight in each end. After the overweight has been ascertained, dials on the second machine are set to coincide with the figure given by the scale readings. The second machine is mounted under a shaver which removes metal to reduce the weight to the required limits. The shavings fall into small balance pans, and automatically stop the cutting operation when the accumulation of chips in the pan equals the amount of original overweight. With this device one operator is able to balance connecting rods accurately in a somewhat shorter time than is required by other methods.—AVIATION, *May, 1932*

Rocker arm bearing

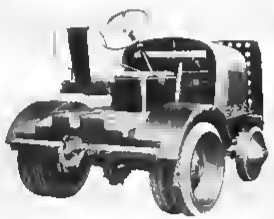
An application of roller bearings to aircraft engine rocker arms has recently been made by The Timken Roller Bearing Company, of Canton, Ohio. The bearing has been used for some time in military airplanes, and has also had some use on commercial engines. This type of bearing is completely self-contained, with rolls and races assembled to form a compact unit easily installed or removed for inspection. It is able to carry a certain amount of thrust as well as radial loading, reducing the tendency of the push rod action to product lateral wear and looseness.—AVIATION, *May, 1932*

Airport fuel apparatus

The S. F. Bowser & Company, Inc., of Fort Wayne, Ind., are offering special gasoline and oil storage and distributing equipment designed particularly for airport use. They build complete equipment of several types including flush-type pits, complete underground storage tanks, and motor driven fuel pumps. The gasoline delivery capacity of the individual unit varies from 16 to 35 gal. per min.—AVIATION, *May, 1932*

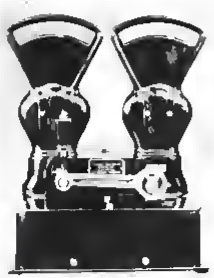
Spray painting equipment

Air brush equipment of all types designed for painting, cleaning, or lubricating automobiles, trucks, or aircraft, has recently been placed on the market by the Paasche Airbrush Company, of Diversey Parkway, Chicago, Ill. This concern builds not only spray nozzles, guns, and tanks in various sizes and degree of portability, but also furnishes a complete line of air compressor and ventilating equipment.—AVIATION, *May, 1932*.

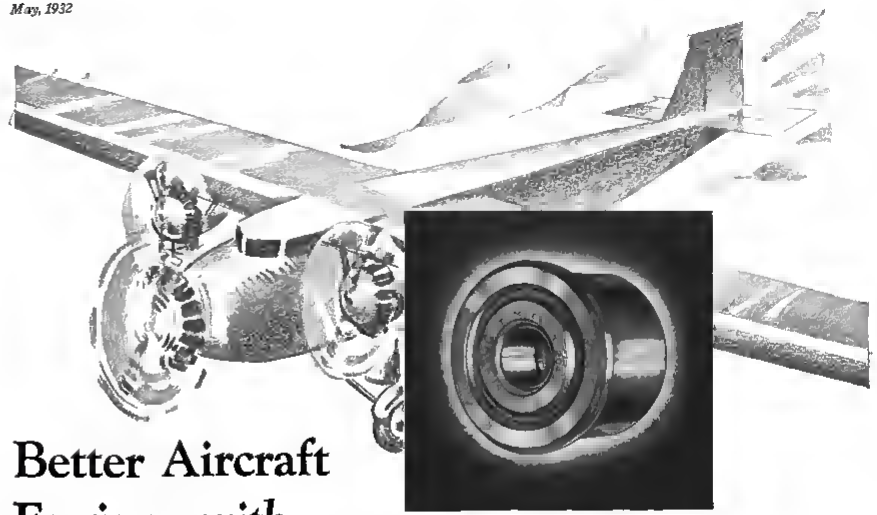


W. & K. heavy duty Tug

Timken rocker arm bearing



The Toledo testing gauge for balancing engine connecting rods. Left: The Stanley light weight electric screw-driver.



Better Aircraft Engines *with* TIMKEN *Rocker Arm* BEARINGS

New—but with 34 years of continuous engineering development behind it, the Timken Tapered Roller Rocker Arm Bearing has demonstrated a capacity to perform and *last* that forecasts the end of rocker arm bearing uncertainty and expense.

Long Life because of the double row of Timken-made steel, precision-ground, tapered rollers operating between precision-ground tapered races of the same enduring material. Wear is infinitesimal.

Dependability because lubrication is positive under all conditions. The unit construction of the Timken Rocker Arm Bearing allows the bearing to be so closely sealed that the lubricant is retained indefinitely despite intense heat and high speed.

Efficiency because friction is virtually eliminated, while Timken tapered construction carries the thrust load set up by the push rod action, thus guarding the bearing against lateral wear and looseness and maintaining accurate rocker operation.

Economy because Timken Tapered Roller Rocker Arm Bearings do not need replacing as often as other types of rocker arm bearings.

Get rid of rocker arm bearing trouble and worry. Specify Timken-equipped rocker arms when buying new engines or planes.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN *Tapered Roller* **BEARINGS**

It's TEXACO *now*

for the entire AMERICAN AIRWAYS SYSTEM

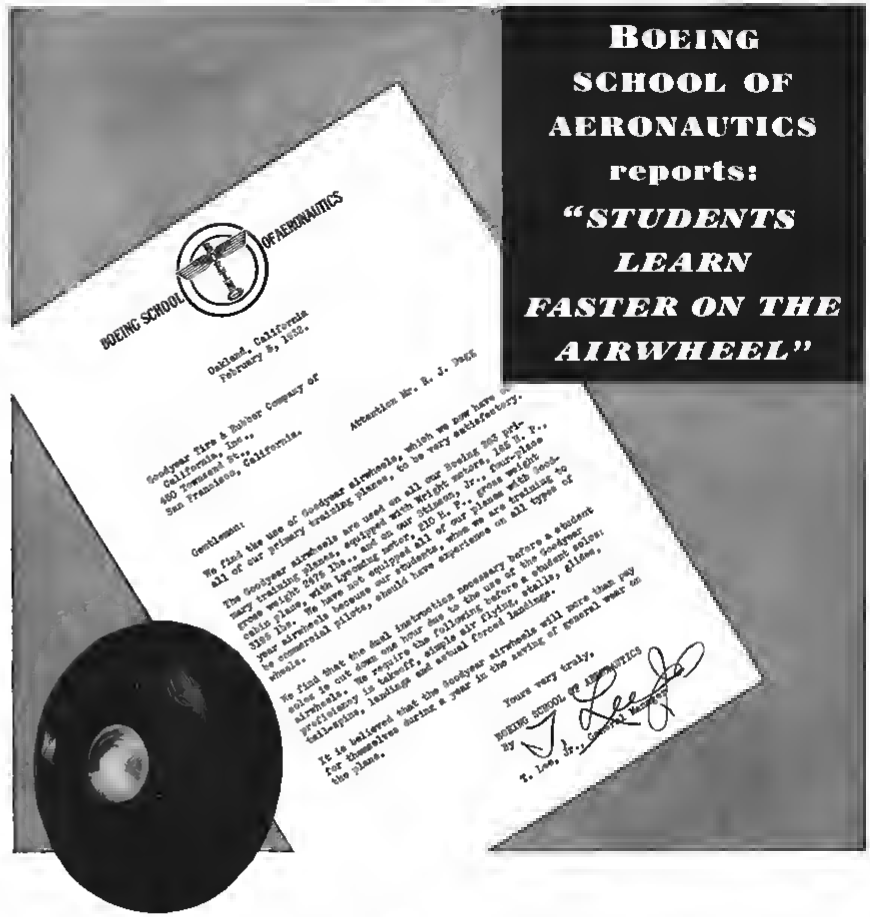
American Airways, Inc. is one of the greatest air transport systems in the world. Its planes covered 7,568,968 miles in 1931 and carried more than 51,000 passengers and over a million and a half pounds of mail. The Company's lines extend from Coast to Coast, from Canada to the Gulf, linking up 60 major Cities in 20 States. • Texaco Aviation Gasoline had been used for some time on the Southern Division of the Company's system. And now with the new series of Texaco Airplane Oils, proved and demonstrated in actual service—American Airways has gone over to Texaco Airplane Oils 100 per cent. • The new Texaco Airplane Oils have a flatter viscosity curve—greater heat resistance—with unprecedented lubricating qualities, low carbon residue and low pour point. • American Airways *knows* what lubricants can do. Completely equipped shops along the lines keep the entire fleet of 143 planes always in perfect trim. Engines are completely taken down after every 250 hours of flight. Micrometer measurements and microscopes are used to determine the condition of every part. It's an exacting test of lubricating performance and the new Texaco Airplane Oils have more than satisfied every demand. • The new Texaco Airplane Oils and other Texaco Aviation Products are available at airports everywhere throughout the country.

THE TEXAS COMPANY 135 East 42nd St., New York City

TEXACO AIRPLANE OILS
TEXACO AERODIESEL FUEL
TEXACO ASPHALT PRODUCTS

TEXACO AVIATION GASOLINE
TEXACO MARFAK GREASES
FOR RUNWAYS, HANGAR FLOORS AND APRONS AND DUST LAYING

BOEING SCHOOL OF AERONAUTICS reports: *"STUDENTS LEARN FASTER ON THE AIRWHEEL"*


BOEING SCHOOL OF AERONAUTICS

Oakland, California
February 8, 1932.

Goodyear Tire & Rubber Company of California, Inc.,
460 Townsend St.,
San Francisco, California. Attention Mr. R. J. Page

Gentlemen:

We find the use of Goodyear airwheels, which we now have on all of our primary training planes, to be very satisfactory.

The Goodyear airwheels are used on all our Boeing NAP primary training planes, equipped with Wright motors, 164 H. P., gross weight 2675 lbs., and on our Stearman, Jr., four-place cabin plane, with Lycoming motor, 210 H. P., gross weight 3350 lbs. We have not equipped all of our planes with Goodyear airwheels because our students, when we are training to be commercial pilots, should have experience on all types of wheels.

We find that the dual instruction necessary before a student solos is cut down one hour due to the use of the Goodyear airwheels. We require the following before a student solos: proficiency in taxiing, single air flying, stalls, glides, tailspins, landings and actual forced landings.

It is believed that the Goodyear airwheels will more than pay for themselves during a year in the saving of general wear on the plane.

Yours very truly,
BOEING SCHOOL OF AERONAUTICS
By T. Lee, Jr., General Manager

Here's another report, added to list telling the safety, the savings, the improvement in flying found in the Goodyear Airwheel.

The whole letter's good, but read these points particularly:

"We find that the dual instruction necessary before a student solos is cut down one hour due to the use of the Goodyear Airwheel."

"It is believed that the Goodyear Airwheels will more than pay for themselves during a year in the saving of general wear on the plane."

For all the facts, write to Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

GOODYEAR

WHEN YOU BUY A NEW SHIP SPECIFY THE GOODYEAR AIRWHEEL

LEADERSHIP ...INCURS AN OBLIGATION

WHICH WACO RECOGNIZES AND ACCEPTS

Spurred on by this relentless obligation of leadership, WACO is offering a selection of airplanes that excel all previous WACO attainments. The new

"Model A", designed especially for the use of private owners, is generally conceded to be the outstanding new development of the year. The cabin WACO,

further refined and improved, remains without an equal in performance characteristics among all cabin airplanes.

The famous Model F, and its big brother, the "F2," familiar at every airport in the land, are continued in production practically without change. In each one of the seventeen models

making up the WACO line for 1932, there is evidence of still greater amplification upon the WACO standards of PERFORMANCE and of VALUE which have earned for WACO its leadership in aircraft registrations. The evidence is confidently presented for your inspection. For WACO has again kept faith.

THE WACO AIRCRAFT COMPANY, TROT, OHIO

WACO AIRPLANES

"ASK ANY PILOT"

WACO LEADS IN AIRCRAFT REGISTRATIONS

7 SIMPLE RULES for LUBRICATION ECONOMY

1. ***Keep your engine in Good Mechanical Adjustment.*** Oil leaks, worn piston rings and loose bearings account for large oil losses. Excess oil temperature and pressure are costly, too. Be sure they are well within the manufacturer's recommended limits, installing an oil cooler if necessary.

2. ***Watch your R. P. M.*** The average engine, at full throttle, consumes more than twice the quantity of oil used at a cruising speed of 85% maximum r.p.m.

3. ***Use an Oil of the Viscosity Recommended by the Engine Manufacturer.*** Every engine is designed with bearing clearances requiring a lubricant of definite viscosity (or body) at operating temperature. Never use a heavy oil solely for the purpose of cutting consumption—excess wear will result.

4. ***Use an Oil having a Good Viscosity Ratio.*** The operating temperature of the engine may vary under different conditions. When heated, all oils tend to thin out. Light oils are more readily consumed than heavy, hence the lubricant changing least with changes in operating temperature will assure the minimum consumption consistent with adequate protection.

5. ***Use an Oil having a High Flash Point.*** As oil vapors are lost through the breathers and combustion chambers, the more volatile the oil the greater the consumption. A measure of volatility is the *flash point*, the lowest temperature at which the vapors arising from the oil will ignite in the presence of a flame. For oils of a given viscosity, the one having the highest flash point is least readily consumed in the engine.

6. ***Use a Superior Grade of Gasoline having Good Anti-Knock Value.*** Since any factor increasing engine temperature increases oil consumption, a cool-running engine is an aid to economy. Within limits, the better the knock rating of the fuel used, the lower the engine temperature.

7. ***Above all, demand a branded lubricant offered by a reputable manufacturer.*** This is your assurance that other characteristics of the oil affecting oxidation and sludging are correct

Stanavo Aviation Engine Oil was developed after exhaustive laboratory and flight tests by the most experienced and reputable producers of petroleum products. It is made to meet exactly the needs of present-day aviation engines—and its quality is uniform the world over.

STANAVO
AVIATION ENGINE OIL

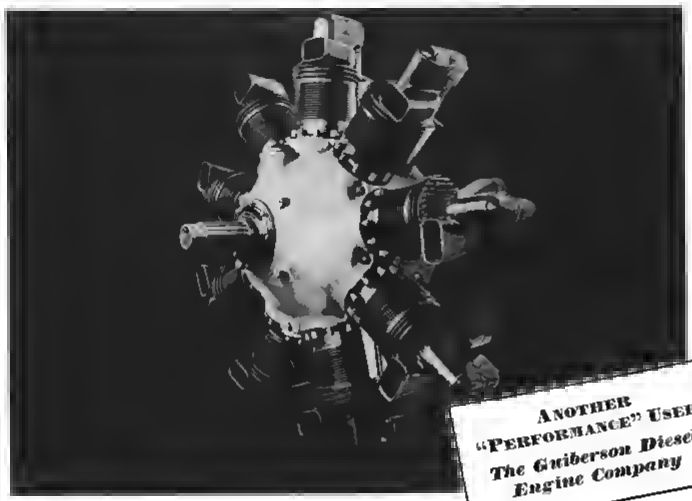
STANAVO SPECIFICATION BOARD, Inc.
Organized and Maintained by

Standard Oil Company of California
225 Bush St., San Francisco

Standard Oil Company (Indiana)
910 So. Michigan Ave., Chicago

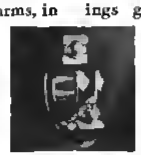
Standard Oil Company of New Jersey
26 Broadway, New York City

PROVEN SKF BEARINGS SELECTED AGAIN FOR PERFORMANCE



WHERE PERFORMANCE TAKES PREFERENCE OVER PRICE

Another new development . . . the Guibersun "Free wheeling" Diesel Air Motor . . . and again SKF Ball and Roller Bearings are selected for *known performance.* A total of 23 SKF's are used on the crankshaft, rocker arms, in the gear unit and to take the propeller thrust. Such wide applicatinn leaves nn dnubt that SKF Perfnrmance Takes Preference Over Price . . . a fitting complement to Guiberson's slogan, "Better be *Safe* than Sorry."



To every important advance in aviation SKF Bearings have been a contributing factor. But more than that, consistent, everyday service, has shown SKF Bearings giving the dependability and long life so necessary in successful cnmmercial and gnvernment flying. In the air, nothing takes the place nf performance . . . and SKF's have the reliability that builds unshakable confidence.

You may buy a bearing as a bargain but try and get a bargain out of using it, for nothing is apt to cost so much as a bearing that cost so little.

2887

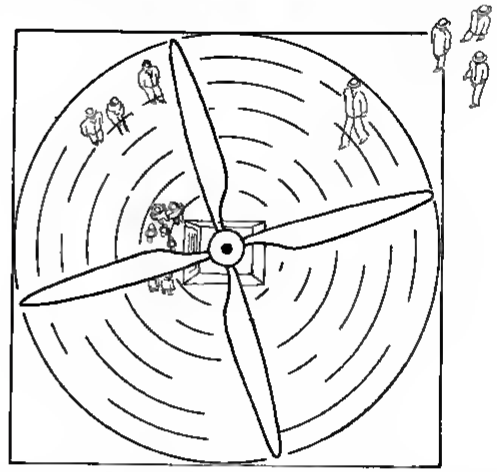
SKF INDUSTRIES, INC 40 EAST 34th STREET, NEW YORK, N. Y.

SKF
Ball and Roller Bearings

. . . a constant centre of

attention

at the National Air Show



The New Wilford Gyroplane

Our exhibit at Detroit included a working model of the rotor system—a radical departure from previous rotor construction. The blades are rigid, being free to move only around their axes. This gives them a free feathering effect which results in exceptional stability in flight and easy control.

THE WILFORD GYROPLANE IS READILY ADAPTED TO ALL STANDARD FIXED WING AIRCRAFT. WRITE FOR DETAILS.

The attention which this new development received at the show was very gratifying. It proved the rapidly growing interest in Gyroplanes on the part of laymen, operators and manufacturers alike.

The Wilford Gyroplane is fully covered hy patents. We are willing to license reputable manufacturers who have ample facilities to build and sell this type of plane.

Won't you write for particulars?

PENNSYLVANIA AIRCRAFT SYND. LTD.
WILFORD BLDG., PHILADELPHIA

KEPT BRISKLY BUSY

PULLING a concrete roller, a "Caterpillar" Tractor smooths the landing field at Washington-Hoover Airport, South Washington, D. C. Larger-size "Caterpillars" do the heavy construction work—smaller sizes park the planes. For the earth-moving jobs of initial construction or later expansion, for the constant tasks of maintenance and hangar and shop service, for a hundred and one duties around every airport—"Caterpillar" Tractors offer versatile, dependable power.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.
Track-type Tractors Combines Road Machinery
(There's a "Caterpillar" Dealer Near You)

Prices—f. o. b. Peoria, Illinois

FIFTEEN	$1100	THIRTY-FIVE	$2400
TWENTY	$1450	FIFTY	$3675
TWENTY-FIVE	$1900	SIXTY-FIVE	$4350
DIESEL	$6500		

CATERPILLAR
REG. U. S. PAT. OFF.
TRACTOR

Western Electric equipped routes flown by Northwest Airways, Inc

NORTHWEST U.S. AIRMAIL EXPRESS PASSENGER SERVICE AIRWAYS INC.

One of Northwest's 19 Western Electric equipped mail and passenger planes

Inside one of Northwest's 8 Western Electric Radio Telephone equipped ground stations

NORTHWEST *pilots keep their schedules*

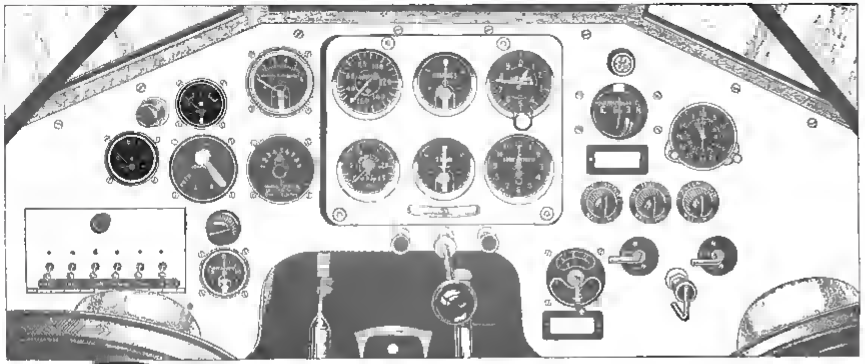
Clearly-spoken position reports from planes in flight—up-to-the-minute weather and landing information from ground stations—transmitted instantly by Western Electric Radio Telephone—assist Northwest Airways to operate efficiently, confidently, on time! ¶ Northwest Airways flies 1,650,000 miles a year, in good weather and bad. To assure dependable two-way radio telephone communication, Northwest has installed standard Western Electric 50 watt crystal controlled airplane systems in 19 planes. And has equipped 8 ground stations with Western Electric 9-B transmitters and 2-B rectifiers. ¶ All the major airlines in the country have standardized on Western Electric. There's special equipment for small planes, too. For details, write to Western Electric Company, Dept. 271 A, 195 Broadway, New York

Western Electric*
Aviation Communication Systems

MADE BY THE MAKERS OF BELL TELEPHONES

*Northern Electric in Canada

LOOK TO ELECTRIC INSTRUMENTS for PERFORMANCE at LOW COST



G-E electric oil-temperature and oil-pressure indicators

General Electric Indicators Lower Maintenance Costs

With General Electric pressure and temperature indicators, the only connection between the engine and the instrument panel is a small-sized electric wire. This takes the place of tubing and other mechanical connections, simplifying the installation and reducing the cost. Furthermore, it results in a substantial reduction of weight, especially where long-distance installations are involved—between outboard engines and the instrument panel. All General Electric aircraft instruments are available in shock-absorbing cases of standard dimensions for flush mounting. Jeweled bearings and luminous pointers and scales are used. Let us send you a copy of our descriptive leaflet, GEA-1349. General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

AËRONAUTIC EQUIPMENT

700-18

SPECIALISTS IN NEW YORK, WASHINGTON, DAYTON, AND LOS ANGELES

Flying from Floating Fields

Think of a plane that can accelerate from rest to flying speed in a short run on deck. Picture a speed range extending from the fast work of observation to relatively slow deck landing. Consider the structural strength needed for coming in continually on steel and being stopped by arresting gear. Add to those specifications easy handling, flashing performance and intrinsic reliability and you have the Chance Vought Corsair. Chance Vought Corporation, East Hartford, Connecticut. Division of United Aircraft & Transport Corporation.

CHANCE VOUGHT CORPORATION

T. W. A. puts wing bins in 14 Fords

Expects each ship to exceed 5000 hours

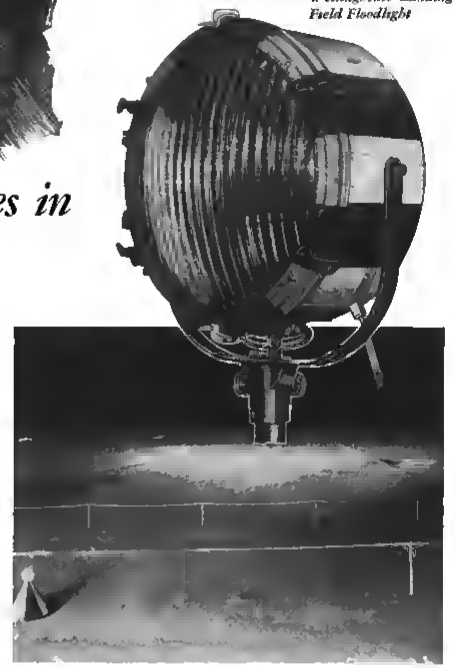
THESE planes were bought before Ford wing compartments were developed. At that time their estimated life was 2500 hours—but each has been flown well over 3000 hours. Transcontinental & Western Air, Inc., is having the wing bins installed at the Ford aircraft factory, confident that each ship will fly at least 2000 additional hours. The mail revenue will make these T. W. A. planes even more profitable.

Ford tri-motored, all-metal transports *have* flown over 5000 hours—and none has ever worn out. Such performance by the earliest types gives airline operators assurance that the newest Ford transports, with their many improvements in design and construction, can provide the utmost in permanence, prestige and profit.

You are invited to visit the Ford airport and aircraft factory and inspect Ford refinements of the past year. Engine installations have been cleaned up for complete accessibility. Larger doors in cabin ceiling permit freer inspection or removal of fuel tanks and fuel lines. Cabin headroom has been increased nine inches; passengers need not stoop when standing or walking in aisle. A special landing gear with semi-balloon tires of very low pressure is now available. It provides passenger comfort during rough field take-offs and landings and makes for longer life in every part of the plane.

FORD MOTOR COMPANY

Westinghouse Landing Field Floodlight



The Night Mail Comes in on WELL-LIGHTED AIRPORTS . .

A MOTOR drones in the distance! A flood of light spreads across the airport. A skilled pilot glides in for a three point landing. The night mail is in!

Is this part of the night scene at your airport? It can be if you are equipped to provide the adequate illumination demanded by twenty-four-hour-a-day air mail.

More and more airports are installing Westinghouse planned lighting systems to help them obtain the business of night traffic. These planned systems have the highest reputation among pilots, and can be progressively and economically expanded for future growth. Begin planning a lighting system today.

The expert advice of a Westinghouse Airport Lighting Specialist is available to assist you. Mail the coupon for further information.

Detroit Airport, lighted by Westinghouse, is one of the few that has been awarded the AIA Rating

THE COMPLETE LINE OF WESTINGHOUSE AIRPORT LIGHTING EQUIPMENT INCLUDES:

1. Alidade, or Ceiling Height Indicator
2. Airways Course Light
3. Landing Field Floodlight
4. Rotating Beacon
5. Code Beacon
6. Screw Type Marker Light
7. Illuminated Wind Tee
8. Wind Cone Assembly
9. Ceiling Projector
10. Obstacle Light
11. Locking Type Marker
12. Flush Type Marker Light
13. Tip-Over Cone with Marker Light and Disconnect

T 79038 **Westinghouse**

Quality workmanship guarantees every Westinghouse product

SEND FOR INFORMATION

Westinghouse Electric & Manufacturing Company
Room 2 N—East Pittsburgh, Pa.

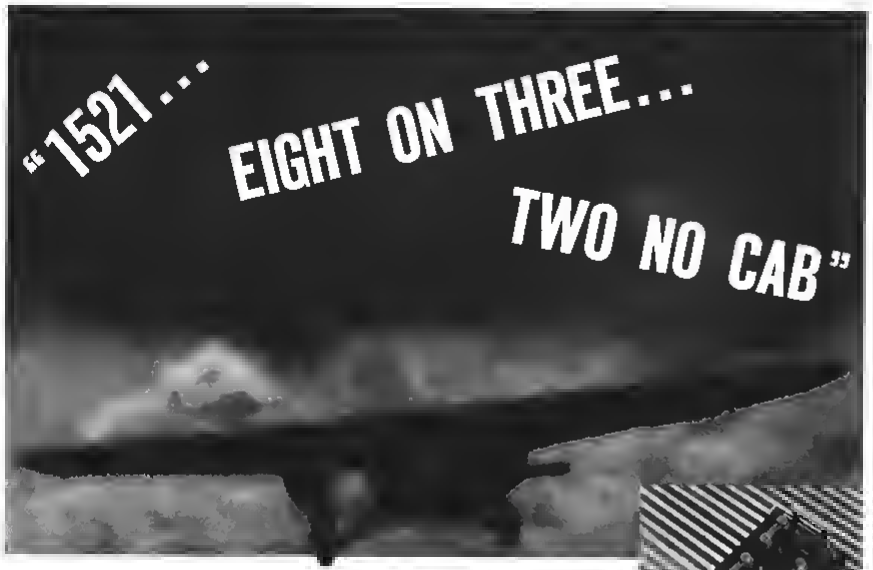
Gentlemen: I am interested in the Westinghouse system of Planned Airport Lighting.

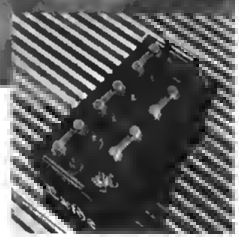
Name .....

Firm .....

Address .....

City ..... *State* ..... A 5-32





The battery that is light weight compact safe —the Exide Aircraft

the pilot tells the dispatch-operator. Exides help make these important landing communications certain

A TRANSPORT roars across the country. Weather reports, positions, landing instructions come to the pilot's ear by radio, through clouds, fog, the black of night. Flying is made safer because of it. And Exide Aircraft Batteries help make this vital radio power a certainty.

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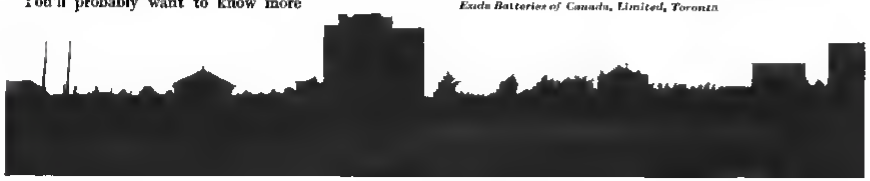

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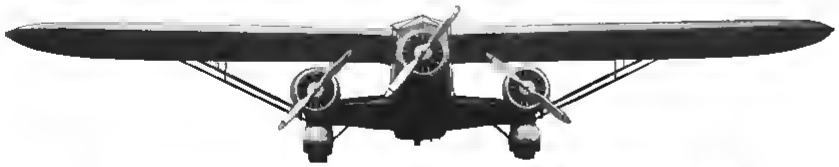

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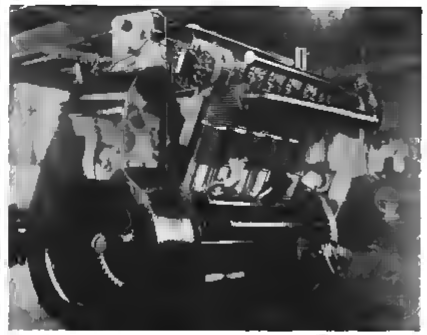

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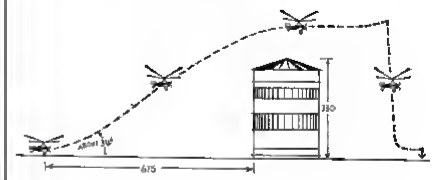

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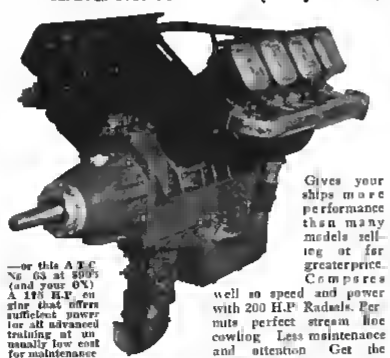

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(Continued from opposite page)

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912

Of Aviation, published monthly at New York, N. Y., for April 1, 1932.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the state and county aforesaid, personally appeared C. H. Thompson, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Aviation, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42d St., N. Y. C. Editor, Edward P. Warner, 330 West 42d St., N. Y. C. Managing Editor, Leslie E. Neville, 330 West 42d St., N. Y. C. Business Manager, Louis F. Stoll, 330 West 42d St., N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42d St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42d St., N. Y. C. James H. McGraw, Jr., 330 West 42d St., N. Y. C. James H. McGraw, Jr., and Malcolm Muir, 330 West 42d St., N. Y. C., Trustees for Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw. Curtis W. McGraw, 330 West 42d St., N. Y. C. Donald C. McGraw, 330 West 42d St., N. Y. C. Anne Hugus Britton, 330 West 42d St., N. Y. C. Mason Britton, 330 West 42d St., N. Y. C. Edgar Kobak, 330 West 42d St., N. Y. C. Grace W. Mehren, 13 West Grand Ave., Chicago, Ill. J. Malcolm Muir and Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 512 Fifth Ave., N. Y. C. F. S. Weatherby, 271 Clinton Road, Brookline, Mass. Midwood Corporation, Madison, N. J., stockholders of which are: Edwin S. Wilsey, Madison, N. J. Elsa M. Wilsey, Madison, N. J.

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C. H. THOMPSON, Secretary
McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 31st day of March, 1932.
[SEAL]
H. E. BEIRNE,
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(My Commission expires March 30, 1933)

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OX5 reconditioned practically as good as new
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Brand New 45 H.P complete with new Pontoons also undercarriage with Air wheels NC licensed as land or seaplane A Keen Little Outfit and priced to sell quick Write or Wire

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The new Continental R 670 —215 H.P., weight 425 lbs. Scintilla equipped.

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Continental Aircraft Engine Company has recently developed the lightest aircraft engine in the world in its horsepower class—the new R-670—approved type certificate No. 80.

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WHERE TO FLY

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Now, right on the cockpit panel, the new Weston Engine Temperature Indicator, Model 602, indicates *actual* cylinder temperature. Cockpit reference thermometers are eliminated.

No calculations . . . no corrections . . . all guess work eliminated . . . the Weston Engine Temperature Indicator automatically compensates for "cold-end" or cockpit temperature. Always before your eyes is the *true* temperature of your engines.

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1. Direct reading—degrees Fahrenheit.
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3. Indicators and thermo-couple leads interchangeable—no adjustments.
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REASONS WHY · THE FLEET IS THE PLANE TO BUY

Built to withstand strenuous service...to fly with that *just-right-feel* which makes plane and pilot one...to out-perform and out-maneuver more costly planes of higher power—THE FLEET has become the choice of the majority of independent flying schools, as well as the staunch favorite of sportsmen flyers. Students, therefore, who would learn to fly in the plane they will eventually buy, should write for the list of Fleet-equipped schools and a copy of the unique booklet, "How to Judge an Airplane."

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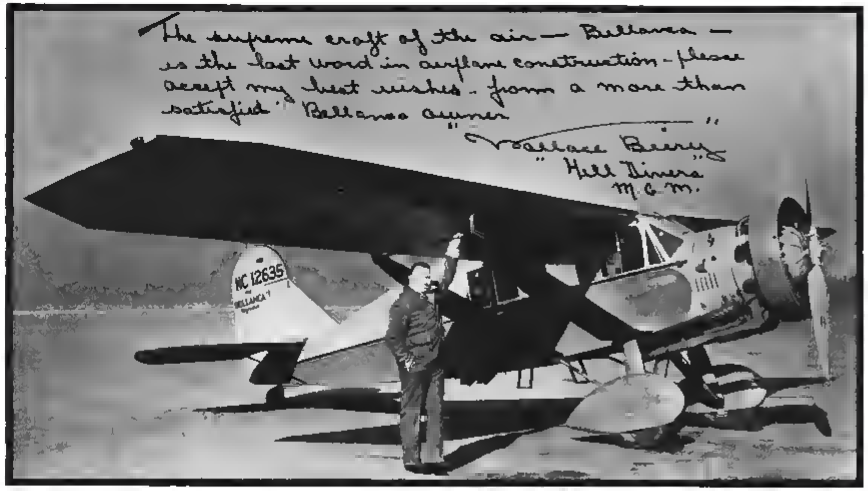


"MORE THAN SATISFIED"

WALLACE BEERY has expressed in his written comment on the accompanying photograph, the true feelings of many other Bellanca owners. Whether in the transport field, industrial organizations or among people who, like Mr. Beery, simply want to get about quickly and safely, the Bellanca owner is usually a man or woman who has had considerable experience with other types and has gravitated *toward the peak of quality and performance.* For the Bellanca—"America's Finest Airplane"—is known first for its quality, and then for its performance. Flight stability, structural completeness, and an all-round reliability proved by many of the greatest flights of history—this is what it means to say "Built as Only Bellanca Can Build."

Seldom does a manufacturer receive comment so spontaneous as Mr. Beery's regarding his new Bellanca SKYROCKET. *Wallace Beery, one of the most popular actors in America, is a pilot in his own right. He was starred in "Hell Divers," "Grand Hotel," and many other Metro-Goldwyn-Mayer pictures.*

BELLANCA

BELLANCA AIRCRAFT CORPORATION
New Castle, Delaware
Bellanca Aircraft of Canada, Ltd., Montreal

THE SKYROCKET DELUXE

Six-place cabin.

Luxurious interior appointments and finish.

The last word in safe, fast air transportation for the gentleman-sportsman and business executive.

Performance as only Bellanca engineers can produce.

THE BELLANCA PACEMAKER

Due to new power and exclusive features of design, the speed of The Pacemaker almost approaches that of The Skyrocket.

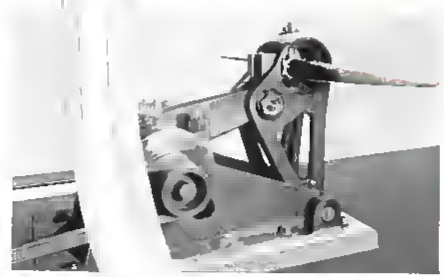
The Pacemaker will out-perform anything in its class.

The plane is banded for radio, wired for night flying equipment, and equipped with adjustable pilot's seat.

■ ALL BELLANCA AIRPLANES ARE EQUIPPED WITH ELECTRIC STARTER AND FULL COMPLEMENT OF INSTRUMENTS.

How RESEARCH *plays its part in*

Hamilton Standard PROPELLER DEPENDABILITY



This vibrating machine (upon which patents are pending) approximates in a few hours the vibration stresses of thousands of hours of flying

The propeller vibrating machine recently developed by Hamilton Standard affords a means of predetermining the resistance of a propeller to fatigue failure from stresses met in actual service conditions. Particularly is this true of the vibration stresses due to the hammer blow effect from the power stroke of the engine. Through the use of this machine a test on the strength of a propeller may be run in a few hours, while it would require several thousand hours to complete an equivalent test in actual service. The practice of subjecting all new designs to thorough tests on this machine constitutes one more basic contribution to Hamilton Standard propeller reliability.

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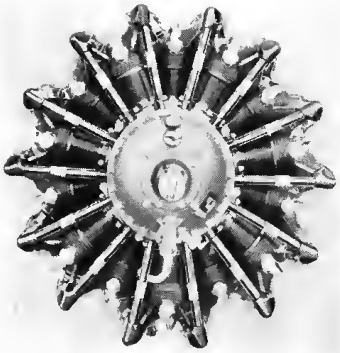

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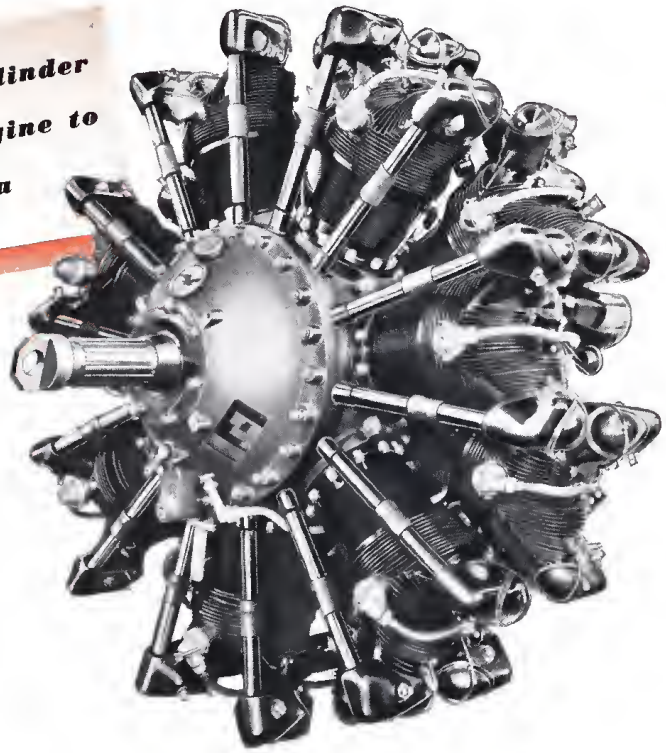
announces the

TWIN WASP JUNIOR

..the first 14-cylinder two-row radial engine to be built in America



With the release of this announcement, a distinctly new engine takes its place in the Pratt & Whitney line. Built to specifications of the United States Navy and developed with the cooperation of its Bureau of Aeronautics, the Twin Wasp Junior lives up to rigid Navy standards of precision, dependability and flight performance. The new air-cooled engine, a fourteen cylinder, radial type, develops 625 horsepower at 2100 r.p.m. It weighs 1.33 pounds per horsepower.

This brilliant new power plant, the first of a series, will offer to the airplane manufacturer exceptional smoothness and vastly increased performance for faster military planes. Because of its small diameter the Twin Wasp Junior has less head resistance than any other radial air-cooled engine of the same power in the world. The same qualities which have centered the interest of military designers upon this newest Pratt & Whitney engine are certain to find wide application in the transport field.

It is characteristic of the engineering leadership of The Pratt & Whitney Aircraft Company that this organization should be the first in America to bring out a line of two-row radial air-cooled engines.

THE
PRATT & WHITNEY AIRCRAFT CO.
EAST HARTFORD . . . CONNECTICUT, U. S. A.
Division of United Aircraft & Transport Corporation
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Wasp* & Hornet* Engines
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